An investigation into the effects of the Scottish smoking ban

By

Toni Musiello

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Abstract

Aim. This study examined the effects of the Scottish smoke-free legislation on smokers' behaviours and attitudes using the transtheoretical model of change (TTM) as a framework. **Design and participants.** A longitudinal design was employed and data was collected from 127 Scottish smokers prior to the smoking ban introduction (T1), and at three (T2) and six (T3) months after the ban had been implemented. **Findings.** Results demonstrated that smokers failed to decrease their cigarette consumption when pre and post ban rates were compared. After the introduction of the ban, positive attitudes towards the smoke-free legislation increased by 20%. Whilst processes of change were used less frequently in the *precontemplation* stage, and increased in the *contemplation* and *preparation* stage, the results did not support the changes hypothesised by stage classification. Furthermore, no differences in the pros of smoking were observed between the stages. However the cons of smoking were rated as less important by those in the *precontemplation* stage ($F(2,122) = 20.871$, $p = .001$, partial $\eta^2 = .26$). **Conclusion.** Whilst findings obtained in relation to attitudes towards smoking were promising, results failed to support the theoretical predictions of the TTM and advocate its use as an explanatory framework for behavioural change. In general, findings failed to corroborate the notion of distinct and quantitative stages of change.

Key Words: Smoking Ban, Transtheoretical Model, Stages of Change, Attitudes, Longitudinal study

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Author’s declaration

I warrant that the content of this thesis is the direct result of my own work and that all references cited have been consulted by myself. No portion of work contained in this thesis has been submitted in support of any application for any other degree or qualification of this or any other university or institute of learning.

Chapter 1

Introduction

On March 26th 2006, Scotland implemented a historic legislation making it illegal to smoke in all enclosed public places throughout the country. The Smoking, Health and Social Care (Scotland) Act 2005 (http://www.opsi.gov.uk/legislation/scotland/acts2005/20050013.htm) was passed by the Scottish Parliament and the Act made it an offence to smoke in any wholly or substantially enclosed public place in Scotland. This comprehensive law covered all indoor workplaces including bars, cafes, restaurants and clubs. The main aim of this enforcement was to protect the general public from the harmful effects of passive smoking. Research conducted by WHO (1999), states that passive smoking is responsible for over 22,000 deaths per annum in the European Union. Within the UK, recent research estimates that passive smoking kills 30 non smokers each day (Jamrozik, 2005), with 865 of these deaths per year in Scotland (Clearing the Air Scotland, 2007). Previous research has suggested that the introduction of smoke-free policies has a direct effect on health outcomes. Decreases in exposure to environmental tobacco smoke (ETS) have been reported (e.g. Allwright et al. 2005; Heloma & Jaakkola, 2003) and this has been linked to a reduction in respiratory symptoms (Allwright et al. 2005). Moreover, admissions for myocardial infarctions have been shown to decrease after the introduction of smoke-free policies (Sargent, Shephard & Glantz 2004), and these policies have also been shown to lead to a decrease in lung cancer rates (Anonymous 2005). The evidence provides strong support for the introduction of nation-wide smoke-free legislations, and suggests they will have a positive impact on improving public health.

In addition to aiming to reduce the harm caused to non smokers through passive smoking, the Scottish Executive legislation endeavoured to have a positive effect on reducing smoking prevalence within smokers. Previous research has shown that complete smoking bans reduce daily smoking rates and tobacco consumption (e.g. Chapman et al. 1999; Fichtenberg & Glantz, 2002; Gallus et al. 2006; & Jaakkola, 2003), and that this reduction is maintained at a three year follow up (Heloma & Jakkkola, 2003). Moreover, smoking cessation rates and quit attempts have been shown to significantly increase as a consequence of smoking bans (Longo et al. 1996; Schorr 2003). Indeed, West (2002) argues that the findings

from Fichtenberg & Glantz's (2002) review suggest that the implementation of a workplace smoking ban is the most effective short-term smoking cessation policy available to governments, short of total prohibition.

When attitudes towards smoke-free legislation are considered, the evidence suggests that public support for smoking bans is high (La Vecchia et al. 2001). In general, public support for smoking bans increases over time and support tends to be shown in greater numbers after legislation implementation (ASH 2006; Gallus et al. 2006; Heloma & Jaakkola 2003; Tang et al. 2003: Lee 2003 cited in Schorr 2003). However, differing results may be observed when levels of support are compared in terms of smoking status. Lund et al. (2007) demonstrated that non smokers reported greater support for smoking bans whilst smokers' support remained static when pre- and post-ban attitudes were considered.

Although past research has shown that smoking behaviours are examined in relation to smoking bans, it appears that very few studies have approached smoking behaviour using a primarily psychological approach. Most of the data are survey-based, cross sectional studies, and examine smoking behaviours in relation to constructs such as quit attempts and daily cigarette consumption. Whilst these outcome measures are important, the current published research fails to provide an insight into the mechanisms behind the process of changing smoking-related behaviours. Based on the author's current knowledge to date, only two research studies have been published exploring the impact of smoke-free policies using health behaviour change models (Cropsey and Kristeller, 2003; Longo et al. 1996). Moreover, whilst several research papers claim to examine attitudes towards the ban, in reality many of these focus on a single variable examining levels of support for the smoking ban, and attitudes are not explored in depth.

A useful framework for understanding how smoking related health behaviours may alter as a result of the smoking legislation is the Transtheoretical Model of Change (TTM) (Prochaska, DiClemente & Norcross, 1992). This model, commonly known as the Stages of Change model, is widely used in smoking research (e.g. Carbonari, DiClemente & Sewell, 1999; Dijkstra, de Vries & Bakker, 1996; Etter &

Perneger, 1999a, 1999b). The model consists of three main constructs: stages of change, processes of change and the decisional balance of changing. It is temporal in nature, and views change as a cyclic process. The TTM is useful as it makes predictions concerning which smokers will be more likely to change their behaviours. The model proposes that the amount of progress individuals make in their behaviour change is directly related to the stage they were in at the start of an intervention (Prochaska, DiClemente & Norcross, 1992, Prochaska, 1996). Whilst research exploring the TTM in relation to smoking bans is relatively scarce, the evidence suggests that smoking bans may result in progressing smokers along the stages of change continuum. The TTM is useful in the current research as it provides a framework for interpreting how the introduction of the smoking legislation may influence individual's smoking behaviours.

The implementation of a smoke-free legislation throughout Scotland created a natural experiment for examining how the ban on smoking in enclosed public places may alter smoking attitudes and behaviours within Scottish smokers. This national intervention generated a unique and innovative opportunity for researching the impact of smoke-free policy using a largely psychological approach. This research project aims to expand knowledge surrounding the impact of smoke-free legislation on smoking behaviours and will contribute to the area in the following ways: The study utilises the transtheoretical model of change (TTM) to explore changes in smoking behaviours and attitudes in relation to the Scottish smoking ban. This has not previously been conducted in Scotland, or indeed carried out in other countries after the implementation of a national smoking ban. Within the published literature, only two previous studies have examined smoking bans in relation to the TTM. Moreover, as most of the work surrounding the TTM has been largely cross sectional in nature, the current study uses a longitudinal framework to explore change over time. In addition this research aims to utilise the three main components of the TTM and explore how stages, processes and the decisional balance construct are affected as a consequence of a national smoke-free intervention. Furthermore, the current study will use alternative measures to test the notion of processes of change and the decisional balance and aim to provide support for their existence and predictability in relation the TTM hypothesis.

Chapter 2

Review of Literature

2.1 Literature review search strategy

The databases searched included Medline, PsychInfo, CINAHL, EBM Reviews and the Social Science Citation Index. Searches were performed using combinations of the following key words: Smoking, tobacco use, smoking bans, smoking legislation, stage of change, transtheoretical model, transtheoretical model of change and attitudes. Only articles published in English were included. Further articles were also obtained by hand searching the reference sections of published papers.

2.2 Smoking and Scotland

The present chapter will provide a brief background to tobacco control policies and detail these in relation to specific behavioural management strategies. Scotland's tobacco control action plan will be briefly presented and information concerning the Scottish smoking legislation will be detailed. The anticipated consequences of the smoking ban are discussed, and the evidence base suggests that these anticipated outcomes are wholly positive for the health of Scotland's residents. Finally, the chapter presents information on Scotland's general smoking trends and prevalence rates, prior to the introduction of the legislation.

2.2.1 Tobacco control

Within the twentieth century, tobacco control methods were virtually non existent. It wasn't until the 1970s that national governments became aware of the health risks and consequences associated with tobacco use and smoking. Although action was instigated during these times in an attempt to protect individuals from the dangers of smoking, West (2006) argues that the tobacco control strategies implemented to date have been "too little, too late" (p.123). Indeed, as late on as 1994, executives of major tobacco companies, Phillip Morris USA and Phillip Morris International, were testifying to the USA Congress that cigarette smoking was not addictive (Altria 2007). Both companies now admit that their claims were inaccurate and concede that smoking is a highly addictive habit.

Since the 1970s the overall trend in developed nations has been to introduce tobacco control policies which attempt to reduce the number of individuals smoking, or dissuade individuals from taking up the habit. This has been carried out in a number of ways. Within the UK, the primary strategies used to control tobacco use focus on three different methodologies. The first strategy is behavioural based and advocates methods which attempt to influence individual behaviours in both current and potential tobacco users. Secondly, tobacco industry focused methods are promoted in an attempt to limit activities that may encourage or maintain smoking. Thirdly, strategies may focus on reducing the harm caused by use of tobacco products (West 2006).

Whilst these three strategies constitute the main areas in which tobacco control measures tend to operate, a wider taxonomy of particular approaches to reduce

tobacco use has been detailed (West 2006). These individual tobacco control approaches and the relevant strategy they relate to are detailed in Table 1 below.

Table 1: Tobacco control approaches and relevant strategies shown to directly influence the growth and reduction of tobacco use*

Tobacco control approaches	Dominant tobacco control strategy
Social coercion	1. Influencing the behaviour of users or potential users
Education and persuasion	1. Influencing the behaviour of users or potential users
Tax increases	1. Influencing the behaviour of users or potential users
Smoking restrictions	1. Influencing the behaviour of users or potential users
Provision of smoking cessation treatments	1. Influencing the behaviour of users or potential users
Restricting tobacco promotion	2. Limiting activities of the tobacco industry
Restricting sales of tobacco to minors	2. Limiting activities of the tobacco industry
Stop-smoking materials	1. Influencing the behaviour of users or potential users
Incentivising smoking cessation	1. Influencing the behaviour of users or potential users
Preventing mis-claiming by the tobacco industry	2. Limiting activities of the tobacco industry
Preventing engineering of tobacco products to promote addiction	3. Reducing harmful use of tobacco products
Requiring the tobacco industry to reduce the harmfulness of their products	3. Reducing harmful use of tobacco products

***(Adapted from information in West (2006) article)**

Table 1 details specific approaches detailed by West (2006) used in population policies to inhibit or prevent tobacco use and reports the wider underpinning tobacco control strategies. It is evident from the factors presented that whilst there may be a dominant control strategy, domains can also overlap and directly impact on other strategies. For example, utilising both strategies of influencing individual behaviours and limiting the promotional activities of the tobacco industry have been shown to reduce the harmful use of tobacco products (Clearing the Air Scotland, 2007).

As evident in the approaches detailed in Table 1, many of the particular tobacco control policies attempt to influence the individual behaviours of potential and actual tobacco users. At the very core of this is an overriding public health focused approach to tobacco control; it is apparent that individuals must change their tobacco behaviours in order to directly impact on the wider realm of public health outcomes. Therefore, smoking restrictions are used as a population policy to facilitate individual behaviour change.

An examination of the taxonomies detailing the frameworks behind tobacco control policies is useful as they provide a greater understanding of how population based behaviour change interventions attempt to influence individual behaviours. The link between the intervention and the expected subsequent behaviour change is explicitly detailed and consequently can be used to inform national policy and practice. West (2007a) argued that the particular approaches and methods detailed focus primarily on readdressing the balance of motivational factors. For example, smoking prevalence will be reduced when becoming a non smoker is far more attractive than being a smoker. In comparison, smoking prevalence will be high in societies where smoking remains attractive and accessible, smoking is permitted freely and where there is little accessible information about the adverse effects of smoking (West 2007a). In essence an evaluation of the pros and cons of adopting or maintaining smoking is promoted by societies. The role of national tobacco control policies is to shift the decisional balance in favour of non smoking and reduce the attractiveness of being a smoker.

Whilst using these particular approaches in conjunction is argued to be the best approach to restricting tobacco use (West 2006), each individual method also has the potential to impact on smoking prevalence. However, the strength of the evidence base for individual strategies varies dependent on the tobacco control method adopted. Within the United Kingdom (UK) the government has tried and tested tobacco control policies to varying effects. The most successful policy to date has been implementing annual tax increases on all tobacco products. Analysis demonstrates a clear evidence based link between lower levels of smoking prevalence and tobacco tax increases (West 2007a). However, the remaining evidence base for alternative public control methods remains unclear, and although some evidence suggests potential benefits, these have not been

robust enough to fully promote the measure. For example, public education campaigns are thought to have reduced smoking prevalence in the 1970s, but there is no clear evidence in the last decade to link these campaigns with smoking prevalence rates (Ibid). However, Jamrozik (2004) argues that there is good evidence for a further five tobacco control initiatives. These approaches include smoke-free policies, public education, reductions in smoking promotion, proved cessation treatments and prosecution (e.g. in restricting sales to minors). However Jamrozik cites little concrete evidence for the effectiveness of these interventions and therefore the reader is unable to draw direct conclusions from his paper.

2.2.2 Scottish tobacco control policy

If we examine tobacco control policies within Scotland, the societal culture and norms surrounding smoking have recently been shifting to cast smoking in a more negative light. This is largely influenced by the devolution of the Scottish Parliament from the rest of the UK, allowing Scotland to have full control in tackling the poor health outcomes of their citizens. The initial introduction of the UK Tobacco White Paper, *Smoking Kills* (1999; cited in NHS Health Scotland and ASH Scotland 2003) prompted the use of particular action initiatives to reduce harm caused through smoking. These were then developed in a later policy document published by the Scottish Executive, *A Breath of Fresh Air for Scotland,* (Scottish Executive, 2004), which set out the government's tobacco control action plan to improve Scotland's health. The document detailed Scotland's approach to reduce smoking prevalence and focused on four broad categories: prevention (action to hasten reductions in smoking prevalence); provision of services (extend and improve cessation services); second-hand smoke (reduce health risks from passive smoking and attempt to "de-normalise" smoking) and protection and controls (legislative action to reduce the availability of tobacco and make it less attractive). These tactics all encompass various elements of the tobacco control approaches and strategies detailed by West (2006).

As a result of this tobacco control action plan and after a largely favourable public consultation, Scotland became the first country in the UK to employ a smoking ban. On March 26th 2006, Scotland implemented a historic legislation making it illegal to smoke in all enclosed public places in the country. The Smoking, Health

and Social Care (Scotland) Act 2005, was passed by the Scottish Parliament and the Act made it an offence to smoke in any wholly or substantially enclosed public place in Scotland. This comprehensive law covered all indoor workplaces including bars, cafes, restaurants and clubs and even company work vehicles. With the exception of private homes and a few exempted premises, it became against the law to smoke indoors in Scotland.

2.2.3 Anticipated consequences of legislation

The main aims of the smoking ban enforcement were to protect the general public from the harmful effects of passive smoking and to reduce the morbidity and mortality associated with tobacco use. Research conducted by WHO (1999), stated that passive smoking is responsible for over 22,000 deaths per annum in the European Union. Within the UK, recent research estimates that passive smoking killed 30 non smokers each day (Jamrozik, 2005), with approximately 865 of these deaths occurring in Scotland each year (Clearing the Air Scotland, 2007). In terms of morbidity, long term exposure to passive smoking is believed to increase the risk of lung cancer by approximately 24% and coronary heart disease by 25% (Ibid). In terms of the impact on mortality, data from the Scottish Executive estimates that the smoking ban will prevent 219 deaths per year from coronary heart disease and lung cancer. Additionally, the ban is anticipated to prevent a further 187 deaths from respiratory disease and stroke (Clearing the Air Scotland, 2007). As there is a direct link between smoking and related diseases such as coronary heart disease and certain cancers, the introduction of the ban should contribute to lower levels of morbidity and mortality in both smokers and non-smokers throughout Scotland.

In addition to reducing the harm caused to non smokers through exposure to environmental tobacco smoke (ETS), the Scottish Executive legislation also endeavoured to have a positive effect on reducing smoking prevalence amongst smokers. Previous research has shown that complete smoking bans reduce daily smoking rates and tobacco consumption (Gallus et al. 2006), and that this reduction is maintained at a three year follow up (Heloma & Jakkkola, 2003).

2.2.4 Public health consequences

Throughout the literature, the impact of smoke-free legislation has been assessed in relation to public health outcomes. Whilst the present study will not explore the impact of the smoke-free legislation on public health outcomes, general findings from the field are presented in order to set the context of the current research. Again, whilst a comprehensive review is not illustrated, information is presented in order to illustrate the link between smoke-free policies, individual behavioural changes and population based health outcomes

The effects of smoking legislation upon public health outcomes are of clear potential significance. In general, the research shows that smoking bans are associated with positive outcomes for both individual well-being and public health. For example, Allwright et al. (2005) examined physiological outcome measures including salivary cotinine concentration (a by-product of environment tobacco smoke (ETS)) and symptoms of respiratory irritation in bar workers. The research was carried out in Ireland before and after the implementation of the legislation for smoke-free workplaces. The researchers found significant decreases in salivary cotinine concentrations after the ban had been implemented. Furthermore, bar staff reported a decrease in exposure to second-hand smoke which was significantly correlated with decreases in salivary cotinine concentrations. In addition, the reporting of respiratory symptoms significantly declined, even after adjustment for potential confounding variables. Similar research was conducted in Scotland and the findings also demonstrate a significant decrease in cotinine concentrations (Haw and Gruer, 2007). The authors showed that the Scottish smoke-free legislation resulted in decreased cotinine levels in smokers and non-smokers living in both smoking and non smoking households. Furthermore, the study found no evidence of displacement of smoking from public places into homes. Haw and Gruer (2007) and Allwright et al. (2005) concluded that the introduction of smoke-free workplaces protects the public from the negative health effects of exposure to cigarette smoke.

Further evidence supporting the health benefits of national smoke-free workplace laws is provided by Heloma & Jaakkola (2003) who conducted a cross-sectional study at three time intervals around the introduction of the Finnish legislation. Their results showed that exposure to ETS and indoor-air nicotine concentrations

steadily declined over time after the introduction of the legislation. The decrease in exposure to both ETS and in the negative effects of second-hand smoke argues for a direct link between exposure to ETS and potential health outcomes (Allwright et al. 2005).

Evidence to support the latter argument in the form of smoking bans impacting directly on specific public health outcomes is presented by Sargent, Shephard and Glantz (2004). The authors reported on admissions for myocardial infarctions before and after smoke-free legislation in Helena, Montana, USA. Their findings demonstrated a significant decrease in reported admissions of myocardial infarctions during the six months after the ban was enforced. As a result, the authors concluded that smoke-free legislation may have an effect on reported morbidity from heart disease. However, this study has been criticised on a number of levels. Kabat (2004) argued that the authors' failure to include information on change in second-hand smoke exposure as a result of the ban confounded the attempt to link the reduction in myocardial infarctions directly to smoke-exposure reductions. Moreover, Kabat suggested that the small decreases observed in heart attack admissions may simply be attributable to chance or other confounding variables. In addition, Surindran (2004) suggested that the authors should consider further factors in interpreting their results, for example, the inclusion of supplementary information should be provided to show that their sample is representative of the larger population. Furthermore Surindran proposed that the authors needed to ensure that the premorbid conditions in both the control and study group were adequately matched.

Whilst these criticisms present alternative interpretations of the findings of Sargent et al. (2004), the authors counter the criticisms in their response published in a later issue of the British Medical Journal (BMJ) (Glantz 2004). They argued that they do provide evidence that exposure to second-hand smoke decreased as a result of smoke-free legislation. Moreover, they also state that Kabat failed to declare competing interests to his commentary and he is alleged to have links to the tobacco industry. Glantz (2004) also argued that the small decreases observed in admissions still reach statistically significant levels, and should therefore be taken as stronger, rather than weaker, evidence for the association. Furthermore, the authors note that Surindran raised important questions and

advocated that larger studies in areas implementing smoke-free legislation should be conducted to fully address these points. Taking these criticisms and responses into account, the authors claimed that their original conclusions were tenable and advocated that smoke-free policies should have positive effects on specific public health outcomes. Additional evidence to support Sargent, Shephard and Glantz's (2004) conclusions comes from evidence taken after the abolishment of this smoking ban, six months after it was initially enforced. A significant increase in admissions for myocardial infarctions was observed after the eradication of the ban (Barone-Adesi et al. 2006), suggesting the authors original conclusions were defensible.

Relative to this, tentative research from Italy and Scotland has also demonstrated a significant relationship between the introduction of smoke-free legislation and admissions for myocardial infarctions. Barone-Adesi et al. (2006) found significant short term reductions in reported acute myocardial infarctions (AMI) when comparing admissions pre and post ban in Italy. The authors suggested that a decrease in active smoking as a result of the ban accounted for a 0.7% drop in AMI during the study period. Evidence from Scotland appears to suggest even more powerful data supporting this relationship. Pell (unpublished) found a 17% fall in hospital admissions for heart attacks in the first year after the Scottish smoking ban was implemented. This compares to a 3% annual decrease observed per annum in the decade before the ban (Scottish Government press release 2007). The evidence emerging appears to demonstrate a clear link between the introduction of smoke-free regulations and its positive effects on health outcomes, particularly admissions for myocardial infarctions.

Additional research conducted by the Medical Association of California (MAC) (cited in Anonymous, 2005, The Lancet) suggested that the introduction of smoke-free legislation has led to positive improvements in Californians' health. In California, smoking has been banned in all indoor public places since 1998, and the MAC presented evidence demonstrating that lung cancer rates have declined far faster in California when compared with states without smoke-free legislation.

2.2.5 Smoking prevalence

Data from the UK's most recent Omnibus Survey suggest that smoking is a declining trend, with an annual decline of 0.4% per annum (Jarvis 2003). Examining prevalence rates in Scotland alone shows that the decline experienced is greater, with a 1% annual decrease reported in observed smoking rates (HEBS 2005). Whilst smoking prevalence rates had levelled out in the early 1990s, smoking rates have been slowly declining since 1999. Jarvis (2003) suggests this is due to the tobacco control strategies implemented by the government as a result of the Tobacco Kills White Paper. The combined effect of increased cigarette taxation, increased smoking cessation services and a comprehensive ban on tobacco advertising seem to have contributed to the decline in smoking prevalence. In the UK as a whole, the most up to date figures put smoking prevalence at approximately 26.2%, whilst in Scotland cigarette smoking prevalence in 2004 was estimated at 31% (West, 2007b).

Within Scotland, the distribution patterns of smokers are considered by age, gender and deprivation category (DEPCAT). Examining the percentage of people smoking regularly by age in Scotland, the highest percentage of smokers are seen in the 45-54 age category, with 36% of individuals smoking. This is followed by 34% of 16-34 year old smoking, 33% of 55-64 year olds smoking and 31% of 35-44 year olds smoking. The lowest percentage of individuals smoking is reported in the 65-74 years of age category (15%) (HEBS, 2005). In 1998, the Health Education Population Survey (1998; cited in HEBS, 2005) demonstrated that across all age categories, the percentage of smokers who wanted to cut down or stop smoking was high. This figure ranged from 49 to 65%. The percentage of smokers reporting that they intended to cut down or quit smoking in the next six months ranged from 25 to 44% (Ibid).

In addition, evidence from the Scottish Household Survey 2003, showed that gender patterns in smoking rates are identical, with 31% of males and 31% of females in the 16-64 age category reporting themselves as smokers (Clearing the Air Scotland, 2007). Furthermore, smoking rates are far higher in lower socio-economic groups, with 70% of Scottish smokers from areas of greater deprivation (Ibid).

2.2.6 Chapter conclusion

Whilst tobacco control policies have existed since the 1970s, the legislation banning smoking indoors in Scotland is by far the most authoritarian policy introduced. This legislation draws on multi-strategical tobacco control methods and aims to influence the behaviour of users or potential users, reduce harmful use of tobacco products and limit activities of the tobacco industry. The anticipated impact of the smoking ban includes reducing exposure to environmental tobacco smoke (ETS) and reducing smoking prevalence rates amongst smokers. This in turn should lead to highly positive impacts on the Scotland's national health and significantly reduce the morbidity and mortality toll directly associated with smoking.

The literature suggests that the impact of smoking legislations can be positively observed in public health outcomes. Decreases in exposure to ETS have been described (e.g. Allwright et al. 2005 and Heloma & Jaakkola 2003) and this has been linked to a reduction in the reporting of respiratory symptoms (Allwright et al. 2005). Furthermore, research suggests that the introduction of smoke-free policies has a direct effect on reducing admissions for myocardial infarctions (Barone-Adesi et al. 2006; Pell, unpublished; & Sargent, Shephard and Glantz 2004), and can also lead to a decrease in lung cancer rates (Anonymous 2005). The evidence reviewed provides strong support for the introduction of nation-wide smoke-free legislation, and suggests that such interventions have a positive effect on public health outcomes.

2.3 Impact of smoking bans on behavioural outcomes

The present chapter reviews evidence concerning the impact of smoking bans upon variables including smoking cessation and quit attempts, consumption, and attitudes towards the smoke-free legislation. It will be shown that the quality of research has generally been high, and that smoking bans are associated with positive outcomes.

Previous research concerning the effects of smoking bans has examined the legislation in a number of different contexts. Partial and total bans have been considered, as well as smoking bans implemented in areas such as prisons, hospitals, workplaces and nation wide. In general, the published studies tend to concentrate on outcome variables such as smoking prevalence (e.g. Chapman et al.1999 & Fichtenberg & Glantz 2002), exposure to environment tobacco smoke (ETS) (e.g. Allwright et al. 2005 & Haw & Gruer 2007) and attitudes towards the smoking bans (e.g. Gallus et al. 2006 & La Vecchia et al. 2001). Although smoking behaviours are examined, it appears that very few studies have approached smoking behaviour in relation to smoking bans using a primarily psychological approach. Most of the data are survey-based and examine smoking behaviours in relation to simple smoking constructs. Whilst these outcome measures are important, the current published research fails to provide an insight into the mechanisms behind the process of changing smoking-related behaviours. Therefore there is a dearth of research into the impact of smoking bans using a psychological epistemology. Moreover, whilst several research papers claim to examine attitudes towards the ban, in reality many of these focus on a single variable examining levels of support for the smoking ban, and attitudes are not explored in depth. Despite these criticisms, the evidence does suggest that the implementation of smoking bans is directly associated with particular changes in smoking-related behaviour. These relationships will be explored in the following sections of this chapter.

2.3.1 Smoking Behaviours

The data collected in relation to smoking behaviours have focused on the effects of smoking bans on variables including smoking cessation, quit attempts, and cigarette consumption. These behavioural constructs may demonstrate how changes on an individual level can have an impact on population outcomes (Clearing the Air Scotland, 2007). Each of these variables will be considered in turn.

2.3.2 Smoking cessation and quit attempts

Smoking cessation rates have been shown to increase as a consequence of preventing smoking in workplaces. In California, the introduction of smoke-free legislation increased smoking cessation among employed smokers (Moskowitz, Lin and Hudes, 2000). The study compared communities with strong smoking restrictions with those without smoking policies at the time of survey. Smokers in communities with strong legislation were 7.3% more likely to have quit smoking than smokers in areas with no smoking restrictions.

In related research, Longo et al. (1996) examined the impact of hospital smoking bans on employee smoking behaviour. The study compared smokers employed in smoke-free hospitals (intervention group) with smokers employed in non smoke-free hospitals (comparison group). Employees working in smoke-free hospitals reported significantly higher post-ban quit ratios than those in non smoke-free hospitals, (0.506 vs. 0.377), even when adjustments were carried out for confounding variables including socioeconomic, demographic and smoking intensity rates. This evidence suggests that the introduction of smoke-free policies within the workplace encouraged employed smokers to attempt to quit smoking. Longo et al. (1996) concluded that the introduction of smoke-free workplaces could greatly improve health care outcomes in employees.

Research presented at the annual American Public Health Association conference by Lee (2003) was reported in a news article by Schorr (2003). Although the percentage of current smokers remained static over time at 18%, the number of individuals reporting that they had quit rose by 4% after implementation of a smoking ban (Lee 2003 cited in Schorr 2003). Quit ratios are often better

predictors of smoking cessation than smoking-prevalence rates as the latter also include individuals who have taken up smoking for the first time. Similar results were obtained in an evaluation of Norway's tobacco control programme (Lund et al. 2007). Whilst there was no significant reduction in smoking prevalence, there was a significant increase in quit attempts amongst smokers.

In addition, reports from Ireland suggest that smoking cessation has increased, with 7000 smokers reporting they had quit smoking since the smoking ban had come into effect (ASH 2006). An additional 10,000 smokers stated that they had decreased their cigarette consumption. However, the authors fail to state the number of individuals who quit per annum prior to the ban enforcement. It is then impossible to know whether these quit attempts are directly associated with smoking prohibition in Ireland.

In contrast to the findings above, a literature review carried out by El-Guebaly et al. (2002) examined the impact of smoking bans in mental health and addiction settings and concluded that smoke-free policies had little or no effect on smoking cessation rates in patients and staff. However, this result must be interpreted with caution as these conclusions were based on a largely qualitative analysis and a meta-analysis was not carried out. In addition, many of the studies included in the review were retrospective. Retrospective studies may not accurately report pre-ban smoking rates as individuals are relied on to accurately recall past smoking behaviours (Ibid). As a result, additional prospective studies which utilise more robust statistical techniques are required to validate the findings of this review.

2.3.3 Cigarette consumption

In terms of cigarette consumption, the evidence suggests that the introduction of smoke-free policies has a direct impact on reducing the amount of cigarettes smoked. Wasserman et al. (1991) used predictive modelling techniques to assess how restrictions on smoking in public places would affect cigarette consumption. Results from a general linear model analysis suggested that stringent laws restricting smoking in private workplaces would decrease overall smoking per capita by 5.9% and result in a negative effect on cigarette demand.

The predictions implicit in the results of Wasserman et al. (1991) were further examined in empirical modelling conducted by Yurekli and Zhang (2000) who investigated the impact of clean indoor-air laws in relation to the demand for cigarettes. The authors utilised a predictive model to show that smoke-free legislation resulted in a significant reduction in cigarette consumption per capita and that this consumption decreased over time.

These predictions appear to hold some validity as shown by empirical research conducted in the field. Evidence for reductions in smoking consumption as a result of the implementation of national smoke-free workplace laws has been provided by Heloma & Jaakkola (2003). They conducted a cross-sectional study at three time intervals around the introduction of the Finnish smoke-free legislation. Individuals were surveyed prior to the implementation of the law and at one and three years after the ban's introduction. Findings demonstrated that tobacco consumption and smoking prevalence were reduced by 5% at the one-year follow up, and importantly this change was maintained at three years post-ban. The long-term reduction in smoking was observed more frequently in the males surveyed, when compared to females. Heloma & Jaakkola (2003) conclude that the introduction of smoke-free legislation has positive effects in reducing smoking consumption and prevalence and should result in an influential impact on public-health outcomes. Moreover, the authors also suggest that such legislation is powerful in influencing social norms, and that modelling behaviours formed as a result of the ban may shape acceptance of non-smoking as 'normalised' behaviour.

Further evidence for a reduction in cigarette consumption is provided by a review conducted by Chapman et al. (1999), which examined the influence of smoke-free workplaces on cigarette consumption in Australia and the United States. The authors pooled evidence from prospective cohort studies in an analysis which compared pre- and post-ban self-reported smoking rates. Their results showed that eighteen studies reported declines in daily cigarette consumption. After the introduction of a smoking ban smokers reported a decrease of approximately 3.5 cigarettes smoked per day (Ibid).

Additional evidence from a systematic review by Fichtenberg & Glantz (2002) showed a reduction in daily cigarette consumption (DCC) after the introduction of smoking bans. Differences in DCC were computed before and after smoke-free workplace enforcement, and the studies reviewed were largely cross-sectional in design and were pooled for a random effects meta-analysis. The authors found that a complete smoking ban in the workplace reduced smoking rates and reported a 3.1 drop in the amount of daily cigarettes consumed (95% confidence interval 2.4 to 3.8). Moreover, supplementary analysis demonstrated that this reduction in DCC remained stable over time. Overall, Fichtenberg & Glantz (2002) concluded that the introduction of smoke-free workplaces is effective and encourages smokers to quit or reduce their cigarette consumption.

Similar results are obtained from research conducted in Italy by Gallus et al. (2006) which examined the effect of smoke-free legislation on cigarette consumption. They demonstrated that cigarette consumption decreased by approximately 8% in the two to three months after the ban enforcement, and reflected similar outcomes from Ireland and the USA (Anonymous, 2005). Gallus et al. (2006) also reported a fall in the mean number of cigarettes consumed per smoker per day, with the effect being greatest amongst younger smokers and females.

Furthermore, a recent article published on the BBC News (2007: http://newsvote .bbc.co.uk/mpapps/pagetools/print/news.bbc.co.uk/1/hi/scotland/6941) website reported information from a survey conducted by a commercial company six weeks after the implementation of the English smoking ban. The survey results suggested that one in ten smokers reported that they smoked less since the implementation of the ban. However, the original source was not cited and no additional details were given to confirm whether the survey sample was representative of the smoking population. Therefore no clear reliability can be ascribed to these findings.

Whilst the above evidence suggests that cigarette consumption decreases as a result of smoking bans, a study conducted by Strobl and Latter (1998) found conflicting results. The research explored nurses' attitudes towards a hospital

smoking ban and its influence on their smoking behaviour. The results showed no significant change in daily cigarette consumption. However, the study can be criticised on a number of factors. Firstly, the study was cross-sectional in nature and only collected data nine months after the introduction of the ban. This retrospective design may have resulted in errors of bias in reporting past cigarette consumption. In addition, the study utilised a small sample size (N = 33) which may not be representative of the population. Moreover, and perhaps most importantly, the hospital smoking ban was only a partial smoking restriction and smoking was still allowed in the staff social club. This provision still allowed nurses to smoke in the work place and therefore the working environment could not be classified as smoke-free. Finally, low compliance with the ban was reported with staff smoking in undesignated smoking areas. These criticisms suggest that the smoking restrictions were having limited impact on smoking behaviours, including cigarette consumption, primarily because they were not strictly enforced. These criticisms caution against interpreting the results gained from this study in any straightforward way.

2.3.4 Attitudes

As previously mentioned, whilst many papers propose to examine attitudes surrounding smoke-free legislation, many in fact explore a simple univariate construct such as public support for the ban or compliance with legislation. This disparity is reflected within the literature where self-reported support for the ban is often taken as a simple measure of attitudes. The majority of the research fails to develop the latter outcome and examine the role of behavioural variables in relation to changes observed in smoking behaviours.

2.3.5 Support for smoking legislation

In terms of public support for the legislation, it appears that, in general, support for smoke-free policies is positive and tends to increase over time. A prospective study examining Italian attitudes towards smoke-free legislation was conducted in 2001, prior to the implementation of national smoke-free legislation (La Vecchia et al. 2001). The authors collected data from a representative sample and found strong support for smoke-free legislation in Italy. Some 83% of Italians were in favour of separate smoking areas in cafes and restaurants, and, in the absence of such separation, supported a total ban in these areas. In addition, 95% of Italians

supported a ban on smoking in public administrative buildings (e.g. hospitals, schools etc). Moreover, 85% of respondents indicated that they were in favour of a total smoking ban in private workplaces. The authors concluded that non smokers and more than 50% of current smokers would support a comprehensive smoke-free legislation in Italy.

The latter prediction was tested by Gallus et al. (2006) who examined the effect of smoke-free legislation on attitudes towards the ban in Italy. The authors conducted two population-based surveys, one carried out nine months prior to the ban, and the other conducted two to three months after the ban (a year gap between data collection periods). Public support for the smoking ban was shown to increase over time, and significant increases in support were observed after the ban had been introduced.

Supporting evidence is found in research into the impact of the smoke-free legislation in Ireland (ASH 2006) which demonstrated that support for smoking prohibition increased after introduction of the ban. The authors compared pre- and post-ban support and found that support for the smoking ban increased after the ban had been implemented from 67% in June 2003 to 82% in August 2004 (Ibid).

Further evidence supporting changes in attitudes as a result of national smoke-free workplace laws is provided by research conducted in Finland. Heloma & Jaakkola (2003) employed a cross-sectional design and surveyed different individuals prior to the law implementation and at one and three years after the ban's introduction. Their results demonstrated a gradual positive shift in attitudes towards the ban as time progressed.

A further study examined changes of attitudes as a result of the Californian smoke-free workplace legislation. Tang et al. (2003) collected data from three different cohorts at three differing time intervals after the legislation. Data were collected from current, former and non-smoking bar patrons and demonstrated that support for the smoke-free legislation increased over time for all participants. Whilst the authors acknowledge that their samples may be prone to selection bias, they suggest that the magnitude of change demonstrated in their results is still

likely to be sustainable after biases are eliminated. Moreover, in agreement with Heloma & Jaakkola (2003), Tang et al. argue that their research provides evidence to suggest a successful and positive change in social norms surrounding smoking attitudes as a consequence of the smoke-free legislation.

Additional evidence for changes in attitudes as a result of California's smoke-free legislation was presented at the annual American Public Health Association conference by Lee (2003) and reported in a news article by Schorr (2003). Lee's research is one of the few studies that attempts to link changes in attitudes with direct observable changes in smoking behaviours. Lee (2003: cited in Schorr 2003) provides evidence suggesting that a positive attitude towards the smoking ban in California was the most powerful predictor of smokers' attempts to quit. Furthermore, their results show that support for the law grew over time from 65% of those surveyed in 1998 to 72.5% in 2002. Approval for the law was found to be highest in those who never smoked and lowest amongst smokers. Whilst these findings contribute towards the evidence base, this study can be criticised for its cross-sectional design which may have biased the results. This type of design allows no casual link to be attributed so that it is impossible to determine whether a change in attitude caused the individual to quit smoking or whether individuals who quit smoking later adjusted their attitudes to reflect their beliefs in favour of the legislation. Whilst we cannot assume a direct causal link between attitudes and behaviours, this research does provide evidence of a relationship between these two constructs.

However, whilst the above studies all note positive increases in support for the smoking bans, research conducted by Lund et al. (2007) in Norway found different results when the views of the general public were compared to those of smokers. The study found that smokers' support for the ban remained static when attitudes collected before and after the smoke-free legislation were compared. In contrast, the general public displayed an increased level of support for the law after the ban had been introduced. This evidence suggests that smokers may be more resistant in their support for smoking bans when compared to support demonstrated by the general public.

2.3.6 Chapter conclusion

Overall, it appears that research exploring the impact of smoking bans leads to a number of conclusions. Despite studies being conducted in various countries and settings, the results obtained from this review of the literature remain consistent. The introduction of smoke-free legislation has demonstrated a link between the introduction of smoking bans and a significant increase in quit attempts and subsequent decrease in smoking cessation rates (e.g. Longo et al. 1996; Moskowitz, Lin and Hudes, 2000; and Lee 2003 cited in Schorr 2003). Similarly, a number of different studies have shown a decline in smoking consumption (e.g. Chapman et al. 1999; Fichtenberg & Glantz 2002; Gallus et al. 2006; & Heloma & Jaakkola 2003) and these decreases in are consistently reported after the introduction of smoke-free legislations, both in practice and within prospective modelling analysis (Yurekli and Zhang 2000; Wasserman et al. 1991).

When attitudes towards smoke-free legislation are considered, the evidence suggests that public support for smoking bans is high (La Vecchia et al. 2001). In general, the results presented shows that public support for smoking bans increases over time and support tends to be shown in greater numbers after legislation implementation (ASH 2006;Gallus et al. 2006; Heloma & Jaakkola 2003; Tang et al. 2003 and Lee 2003: cited in Schorr 2003). However, differing results may be observed when levels of support are compared in terms of smoking status. Lund et al. (2007) showed that non smokers reported greater support for smoking bans whilst smokers' support remained static when pre- and post-ban attitudes were considered.

Whilst changes in behavioural outcomes have been observed as a result of smoke-free legislations, most research fails to consider the impact of such policies in the context of a psychological framework. Links are established between smoking bans and behavioural outcomes, but no effort is made to interpret these with a strong theoretical basis. Instead, the literature base simply acknowledges that these changes occur and very few studies have examined the introduction of smoking bans using a psychological theory. Therefore, the published research makes limited attempts to provide a theoretical explanation of the psychological rationale behind behaviour change in relation to smoke-free policies. The use of this epistemology would further assist in understanding the processes and

methods individuals use to change their smoking behaviours as a result of the introduction of smoke-free legislation.

Chapter 3

3.1 Theoretical background to study

The present chapter reviews the theoretical position of the study. Alternative health behaviour change models will be briefly discussed, before introducing the chosen theoretical model for the current research, the Transtheoretical Model of Change (TTM). This theoretical model will be introduced and explained, in specific relation to smoking. It will be shown that the TTM is a useful predictive tool in determining which smokers are most likely to change their smoking behaviour. In addition the TTM will be explored in relation to smoking bans, however the literature published exploring this context is relatively scarce.

Whilst conducting background research and developing the project objectives, alternative health behaviour models were considered before the final theoretical position was decided upon. Many of the health belief models examined stem from a simple motivational model traditionally utilised in the health promotion field. This motivational model examined elements including desire to change, intention to change and facilitators and barriers to change. Whilst most of the current models utilise elements of this simple model, they also attempt to expand this traditional model with further explanatory variables.

The Health Belief Model (HBM) and the Theory of Planned Behaviour (TPB) were considered for the current study, but were dismissed as inappropriate for this specific study's position. A very brief introduction to each model is given below, and reasoning for not adopting these models for the current study are also provided. It is acknowledged that Bandura's (1986) Social Cognitive Theory (SCT) may have been a useful framework for interpreting the current study's findings. The SCT has been used to study a wide variety of health behaviours and examines learning as a reciprocal inter-relationship between behaviour, environment and personal factors.

The Health Belief Model (HBM) (Rosenstock 1966, Becker et al. 1977; cited in Ogden 2000) predicts that health behaviour is directly linked to core perceptual beliefs including susceptibility to illness, perceived severity, perceived threat and

costs and benefits of change, which all account for a person's readiness to act. In addition, internal or external cues to action are advocated to activate behaviour and move an individual towards overt behaviour change. The model promotes that these core beliefs act as predictive variables and are used to determine the likelihood that a behaviour will occur. The HBM primarily focuses on an individual's assessment of their threat perception and behaviour evaluation (Abraham & Sheeran, 2007) and can be used as a motivational framework to engage individuals in behaviour change. The model is mainly used to explain and predict preventative health behaviour, but it can also be applied to illness behaviours. Whilst research into the HBM has demonstrated support for the model, in recent years the model has fallen out of fashion. However, the reasoning behind the rejection of the model is based on its weaknesses. The HBM was initially constructed to provide a theoretical framework describing individual differences in preventative screening uptake. Whilst it has been adapted for use in other health behaviours, including smoking and alcohol abuse, these behaviours are very different to the initial screening behaviour the model was created for and therefore caution must be utilised when transferring the model's predictions into other health behaviour domains. Additional criticisms concern the fact that the model focuses primarily on the individual and fails to take account of further social or cultural influences that also influence health behaviours.

In addition, the HBM is a static model which fails to account for the process of change and does not explain how beliefs and behaviours alter over time (Schwarzer 1992: cited in Ogden 2000). Further inherent weaknesses of the model include that individuals are perceived as being able to rationalise the processing of information and there is no role for emotions such as denial and fear (Ogden 2000). A further limitation of the HBM is that there is a lack of concise and rigorous methods for measuring beliefs. Consequently, studies use different methods to assess beliefs making cross study comparisons difficult (McCormack Brown 1999).

However, the main criticism of the HBM concerns the fact that each predictor variable is portrayed as an independent variable, but some researchers have argued that this is not accurate. For example, Sheeran & Abraham (1996) argue that perceived susceptibility and perceived severity contribute to influence the

perceptual threat variable, and therefore these cannot be classified as independent variables. In addition, they argue that the HBM is a flimsy structure and fails to accurately define the theoretical concepts or to provide guidelines on how the different variables may combine to predict behavioural change. Moreover, Sheeran & Abraham (1996) also suggest that previous research has demonstrated that the HBM variables correlate weakly with behavioural outcomes and therefore propose that the model has weak predictive validity. A further criticism of the HBM is that a key element of the model involves individuals acting to avoid a negative health consequence. However, not all behaviour change is motivated by negative consequences, for example an individual may quit smoking for positive reasons, such as feel healthier or to save money.

In a similar vein, the Theory of Planned Behaviour (TPB) (Ajzen 1985, 1987: cited in Ajzen 1991) proposes that behavioural intentions are the result of several core beliefs. These include attitudes towards the behaviour, the subjective norms surrounding the behaviour and the perceived behavioural control of the individual. Ajzen proposes that the best predictor of behaviour is intention. The TPB provides a framework for studying attitudes towards changing behaviour, and takes into account an individual's perception of their ability to control their behaviour. In general, the more positive the subjective norm and attitude towards the behaviour, and the greater the perceived behavioural control, the stronger the behavioural intention will be.

Whilst the TPB is widely used in health behaviour change and empirical support for the model appears promising, the model has been criticised on a number of levels. The main criticism levied surrounds the fact that behavioural intention does not necessarily equate to behaviour change. As shown in other health behaviour models, (for example the TTM), individuals contemplating behaviour change, i.e. intending to change, don't necessarily move on to make the actual behaviour change and often get stuck procrastinating. Therefore, an intention to change behaviour does not always equate to actually implementing the behaviour change. In addition to this, Schwarzer (1992; cited in Ogden 2000) has criticised the TPB for omitting a temporal construct. The reader is unable then to deduce when the model constructs are thought to take place. Is it over weeks, months or years? The TPB has also been criticised for failing to ascertain the direction of causality between the predictive components of the model and the stated outcomes (Ibid).

In addition the TTM advocates that humans are rational beings who make decisions based on the information available to them. In this respect, the TPB fails to include an emotional element, such as denial or fear. Dutta-Bergman (2005) argues that this is a decisive drawback for predicting health related behaviours. In addition, the model assumes that individuals consider the implications of their actions before they decide to engage or not engage in particular behaviours. This is certainly not relevant to smoking behaviours, which can often be carried out as a result of habitation or addiction.

However, one of the key reasons for rejecting the TPB concerns criticisms cited by Armitage & Conner (1999) who argue that the model requires further conceptualisation, clearer definition and would also benefit from the addition of further explanatory variables. For example, Armitage & Conner agree with other critics in the field who argue that the notion of perceived behavioural control is too simplistic, and may actually reflect more than one construct. The authors suggest that this variable may be more predictive if it were to be split into perceived ability/self-efficacy and perceived control. Furthermore Conner & Armitage (1998; cited in Armitage & Conner 2000) believe that the addition of further variables providing a social context, for example moral norms and self identity, would greatly improve the predictability and validity of the model. Whilst this model could provide a useful context for the current study, the criticisms cited led to a decision not to take it forward as the theoretical framework for the current study.

3.2 Transtheoretical Model of Change (TTM)

Consequently, a useful framework for understanding how smoking related health behaviours may alter as a result of the Scottish smoke-free legislation is the Transtheoretical Model of Change (TTM) (Prochaska & DiClemente, 1982, 1983; Prochaska, DiClemente & Norcross, 1992; Prochaska & Velicer, 1997). The TTM was initially developed in the context of smoking behaviours (Prochaska & DiClemente, 1983) and is widely used in smoking research (e.g. Carbonari, DiClemente & Sewell, 1999; Dijkstra, de Vries & Bakker, 1996; Etter & Perneger,1999a, 1999b; Prochaska et al. 1988; Prochaska et al. 1991). Indeed most of the research conducted using the TTM is in relation to smoking cessation (Rosen, 2000). In terms of smoking, the model is used to show the stages of change a smoker undergoes in order to successfully quit the habit and illustrates

the processes and decisions involved in changing smoking behaviours (DiClemente et al. 1991). This model was chosen as an explanatory framework as it has been specifically designed and developed using smoking behaviours as an illustration. Moreover, the TTM is dynamic in nature and contains a temporal element, allowing one to examine how behaviour change occurs over time. The TTM is also useful as it does not expect individuals to be rational, rather, the model accounts for emotions including denial and fear and includes the notion of relapse in developing health behaviour change. Moreover, the TTM focuses on behaviour change as a process, not a simple dichotomy (i.e. you either smoke or you do not), and attempts to provide a framework for explaining the individual elements of behaviour change.

The transtheoretical model of change is motivational in nature and is most commonly known as the Stages of Change model. It is utilised as a theory to explain behavioural change in relation to smoking and other health related behaviours. The model draws on an integration of theories including behaviourism, cognitive therapies and existentialism, hence the term transtheoretical (Prochaska et al. 1988) and focuses on intentional change. The TTM makes use of four main constructs, the stages of change, the processes of change, the decisional balance involved and self efficacy (Prochaska, 1985). The stages of change represent a series of discrete motivational stages indicating an individual's readiness to change. The processes of change describe the processes or strategies that assist a person's progression through the stages of change. Decisional balance refers to the perceived pros and cons of changing the behaviour. Finally, self efficacy represents the individual's confidence in their ability to change (Ibid).

3.2.1 The stages of change

The model has evolved since it was first introduced and now includes five stages of change – precontemplation, contemplation, preparation, action and maintenance, which eventually leads to termination of the behaviour. Individuals are hypothesised to progress through these stages of change as they attempt to modify their problem behaviour. Brief descriptions of each of the five stages are detailed below.

Precontemplation

Individuals in this stage of change are not actively intending to change their target behaviour within the next six months. Prochaska et al. (1992) propose that precontemplators are under-informed or ill-informed about the consequences of their behaviour, and have tried to change their behaviour on a number of occasions but failed to succeed. Precontemplators are often characterised as unmotivated or resistant to change in other behavioural theories. They may be unwilling to recognise or modify their problem behaviour and tend to avoid information seeking behaviours. Velicer et al. (1998) advocate that individuals in the precontemplation stage are often mismatched with traditional health promotion campaigns as these tend to be incongruent with their needs.

Contemplation

Individuals in the contemplation stage of the transtheoretical model are intending to change their behaviour in the next six months. They are aware that a problem exists and whilst they are seriously thinking about changing their behaviour, they have not made a defined commitment to take action. In essence they know what they would like to change, but are not quite ready to make the change (Prochaska et al. 1992). Contemplators have assessed the advantages and disadvantages of their behaviour and whilst being more aware of the pros of adopting a new behaviour, they are also sensitive to the cons of leaving the old behaviour behind. The decisional balance is often equally distributed between the pros and cons of change, and consequently individuals may remain in this stage for a significant amount of time. This ambivalence can paralyse them and result in chronic contemplation whereby behaviours are centred around procrastination. The TTM developers suggest that individuals in the contemplation stage are not ready for traditional action orientated interventions (Prochaska et al. 1992).

Preparation

Individuals in this stage of the transtheoretical model are intending to take action to change their behaviour in the next month and have unsuccessfully taken action to change in the past year. This stage combines both intention and behavioural criteria, and individuals in the preparation stage generally utilise active problem focused self change strategies (Prochaska et al. 1992). Some small behaviour

changes are usually implemented in this stage, such as cutting down on the amount of cigarettes smoked (DiClemente et al. 1991). The authors suggest that individuals in this category will respond positively to action orientated behaviour change interventions (Velicer et al. 1998).

Action

People grouped within this stage have taken action to change their behaviour within the past six months. Taking action is classified by the overt behavioural efforts observed in this stage, whereby individuals modify their behaviour and environment in order to tackle their problem behaviour. In order to enter the action stage, individuals must meet specific criterion in relation to the problem behaviour. For example, within the context of smoking, those cutting down on cigarette intake would not be classified in the action stage. However, smokers who had completely stopped smoking would be categorised in this stage (Prochaska et al. 1992). Individuals in this stage have to be particularly conscious of the potential to relapse, and often use particular problem focused strategies to cope with this (Velicer et al. 1998).

Maintenance

Individuals in the maintenance stage of the transtheoretical model have maintained their behaviour change for over six months (Prochaska et al. 1992). Although individuals in this stage still work at preventing complacency, they become more confident in the belief that they will not relapse. Moreover, individuals in the maintenance stage do not apply change processes as frequently as those in the action stage (Velicer et al. 1998). This suggests that the behaviour change is less of a challenge to the individual, and implies that the target behaviour is becoming habitual. The maintenance stage can be characterised in terms of stabilising the behaviour change and working to prevent relapse (Prochaska et al. 1992).

Examining the stage distributions in specific relation to smoking, a study conducted by Velicer et al. (1995) found that smokers in the USA were evenly distributed across the first two stages of change. They collected data from three representative samples and found 40% of smokers were in the precontemplation

stage, 40% were in the contemplation stage and 20% were classified in the preparation stage. Additional research published by Wewers et al. (2003), found different stage classifications for American smokers. Data collected from 1992-1999 showed relatively stable stage classifications, with 59% of smokers in the precontemplation stage, 33% in the contemplation stage and 8% in the preparation stage. However, these results may be specific to smokers from the USA. Etter, Perneger & Ronchi (1997) analysed data from four large European samples and whilst they found similar stage classifications in all European samples, these distributions were different from the American samples. Within the European samples, 70% of smokers were precontemplaters, 20% were classified within the contemplation stage and the remaining 10% were in the preparation stage. These differing population distributions provides evidence suggesting that societal and cultural norms may impact directly on an individual's current stages of change classification.

In relation to smoking prevalence, Etter (2004) has shown that across the USA, areas of high smoking prevalence are associated with more smokers in the precontemplation stage of change. In addition, higher smoking prevalence was also associated with higher addiction rates and lower quit attempts.

Research has demonstrated that smokers in the preparation stage of the model smoke less, show an increase in quit attempts, are less addicted to nicotine and rate the costs of smoking to be higher than the benefits (DiClemente et al. 1991). Smokers in the preparation stage are significantly more active in their attempt to change their smoking behaviours, demonstrating the most lifetime quit attempts than smokers in other stages (Ibid). Within other stages, precontemplators report being most addicted to smoking followed by individuals in the contemplation and preparation stages (Fava, Velicer & Prochaska, 1995). Furthermore, research has demonstrated that in a one and six month follow up, individuals classified in the preparation stage were more likely to have stopped smoking than those in the pre-contemplation and contemplation stages (DiClemente et al. 1991, Farkas et al. 1996). These findings suggest that the TTM is a useful predictory tool allowing assessment as to which smokers may be more likely to alter their smoking behaviours.

3.2.2 The processes of change

The process of change essentially describes the methods or strategies individuals use in each of the five stages of change. These strategies are believed to facilitate movement through each stage. Individuals use many different self-change strategies to tackle their behaviour and Prochaska et al. (1988) suggest that these concentrate around two factors, Experiential (now termed Cognitive-Affective; Rosen, 2000) and Behavioural processes. The authors suggest that these two factors can be categorised by ten specific processes of change. For example, within the Experiential factor, self change processes include: consciousness raising; dramatic relief; environmental re-evaluation; social liberation and self re-evaluation. Processes grouped under the behavioural factor include: helping relationships; stimulus control; counter conditioning; reinforcement management and self liberation (Ibid). However, the authors note that the high correlation between both cognitive-affective and behavioural processes suggests that there is not a clear distinction between these two factors, and many of the self change processes may actually reflect both experiential and behavioural activities.

The use of different processes are emphasised at different stages (Perz, DiClemente & Carbonari 1996; Munro et al. 2007). The experiential processes of change, reflecting intention, are said to occur within the earlier stages of the model, and the behavioural processes of change, indicating actual behaviour, are believed to be used more frequently in the later stages (Prochaska et al. 1998). Furthermore, (Prochaska et al. (1991; 1998) argue that processes of stage are related to stages in a curvilinear function: the use of processes are low in the precontemplation stage, increase in the middle stages and then decrease again in the latter stages of the model. In addition, successful stage transitions are said to be influenced by using the right processes at the right times. Individuals who have been successful at quitting smoking have been shown to engage in more experiential processes in the precontemplation and contemplation stages and more behavioural processes in the action stage (Perz, DiClemente & Carbonari 1996). Moreover, in a cross sectional study conducted on smoking cessation, highly significant differences were seen in the strategies adopted by self changers across the five stages of change (Prochaska & DiClemente, 1983: cited in Prochaska et al. 1985).

Whilst the use of different processes can be observed against the five stages of change, they are also believed to be important predictor variables. In the context of smoking, processes of change were the single most important predictor of stage progress when compared to other variables including demographics, health history and reasons for smoking (Prochaska et al. 1985, Wilcox et al. 1985; cited in Prochaska, DiClemente & Norcross, 1992).

3.2.3 The decisional balance construct

In addition to the stages and processes involved in behaviour change, the TTM emphasises the importance of individuals' evaluation of the advantages and disadvantages of the problem behaviour (DiClemente et al. 1991). The authors term this the decisional balance and advocate its role as an inherent element within the model. It is argued that individuals at different stages of change will either focus on the benefits of the behaviour (for example a belief that quitting smoking will improve their health), or on the costs of a behaviour, (e.g. quitting smoking will increase my stress levels) (Prochaska et al. 1992). This subjective evaluation of the pros and cons of changing has been found to vary across the stages of change (Fava et al. 1995). For example, individuals classified in the precontemplation stage have been found to judge that the pros of their smoking behaviour outweigh the cons and consequently these individuals have the most positive attitude towards their smoking behaviours (Ibid). In contrast, those in the maintenance stage perceive that the cons of their smoking behaviour outweigh the pros (Prochaska, 1985), therefore displaying a negative attitude towards their smoking behaviour. Thus the pros of smoking decrease in a linear pattern across the stages of change. The evaluation of the advantages and disadvantages of smoking has been found to predict smoking cessation (Velicer et al. 1985), suggesting a useful tool for improving targeted interventions (Etter & Perneger, 1999a). Moreover, research conducted in Europe suggests that the patterns of pros and cons across the stages is similar to that found in U.S.A. populations, therefore demonstrating evidence for a universal concept (Dijkstra, De Vries & Bakker, 1996).

3.3 The dimensions of the Transtheoretical model of change

The Transtheoretical model involves emotions, cognitions and behaviour and suggests that the individual is at the core of the process. The model concentrates primarily on three defining dimensions: the processes of change, the stages of change and the decisional balance which all relate to developing the level of intervention (Prochaska et al. 1988). If the model is examined as a stand alone concept, the processes of change can be viewed as the independent variables, and describe the methods or self change strategies that individuals utilise to change their problem behaviour. The decisional balance can be viewed as a further independent variable, detailing an individual's assessment of the pros and cons of changing a behaviour. The stages of change represent a temporal dimension describing when particular changes occur, and the transition between the stages are the dependent variables. Lastly, the level of intervention can thus be designed to correspond to a particular individual's problem behaviour/ needs and can be considered as one of the independent variables (Ibid).

3.4 Criticisms of the Transtheoretical Model of Change

The remainder of this chapter aims to explore the criticisms of the transtheoretical model of change (TTM) in relation to published evidence. Criticisms of the model will be introduced, discussed and critiqued. It will be shown that the TTM is a controversial model of behaviour change, yet the criticisms levied at the model are not conclusive.

The transtheoretical model of change is the prevailing stage based model in the health psychology field (Sutton, 2007). Whilst the large majority of literature into the use of the model focused on smoking cessation, it has also been successfully applied to other problem behaviours such as drug addiction, weight management and condom use (Prochaska et al. 1994). Whilst the model has been adopted as the dominant model in stages of change theories, the controversy and theoretical arguments surrounding the model are ubiquitous.

3.4.1 The categorical vs. continuum debate

The most commonly cited criticisms of the transtheoretical model concern the arbitrary time stages whereby individuals are stated to pass from stage to stage. For example, the distinction between action and maintenance stages is seen in a six month cut off – those under six months are in the action stage, whilst those over six months are in the maintenance stage. Therefore, an individual can pass through the stages simply as a result of the passing of time, and no cognitive or behavioural changes are necessary to progress stages. West (2005) argues that the stages are arbitrary and therefore have little meaning or usefulness. In addition, Bandura (1997) has argued that the random cut off point suggests that the stages are not distinct and that in fact, they may be pseudo stages rather than actual stages of behaviour change. Weinstein, Rothman and Sutton (1998) developed this argument and suggested that pseudo-stages conceal an underlying continuum against which stage theories occur. Whilst the transtheoretical model argues that important variables differ across the different stages, Weinstein et al. (1998) suggest that perhaps individuals are at different places along a linear continuum instead. The suggestion is that the stages of change are simply categorical descriptions of continuous variables.

Furthermore, the limited ability of the techniques used to measure the different stages and the inappropriateness of the statistical tests used to analyse the data, have raised questions concerning the existence of discrete stages (Littell & Girvin 2002). Some evidence has suggested that using hierarchical factor models to analyse the stages have shown a single underlying factor fits the data better than a stage model (Budd & Rollnick 1996: cited in Littell & Girvan 2002). Furthermore, Davidson (2002) concludes his critique by stating that the stages probably represent artificial markers on an underlying continuum of motivational change. Bandura (1997) has argued that this stage model cannot account for the multifaceted complexities involved in behaviour change and therefore oversimplifies the process. Indeed, even Prochaska and DiClemente (1998) cited in Littell & Girvan 2002) acknowledge that there is still dispute over “whether change is best represented as a continuous process or by discrete stages” (p.39).

A meta-analysis conducted by Marshall & Biddle (2001) adds weight to the continuum argument. The authors examined the TTM in relation to levels of physical activity and exercise. Their conclusions stated that the existing data are unable to corroborate that changes in the domains of physical activity and exercise are directly related to unique stages. Their analysis was unable to provide conclusive evidence demonstrating that stages of change were distinctly different, and therefore change may still occur along adjacent segments of an underlying continuum.

Whilst these findings have been unable to demonstrate conclusive evidence for definite stages of change, they have also been unable to certify that distinct stages fail to exist. It may be that the five stage categorisation of stages in incomplete and further subtypes of individuals can be identified within each stage (Norman et al. 2000). As a result, one cannot dismiss the TTM; rather what is required is further research exploring the stages and the variables that influence stage progression. If this research demonstrated linear relationships between variables in the different stages, then one could hypothesise that the TTM wasn't stage specific and instead represented an underlying continuum (Weinstein, Rothman & Sutton, 1998). However, if the TTM could accurately predict which variables change the most between which stages, this would provide strong evidence for definite stage distinctions and overtly demonstrate different changes in variables (Ibid).

If one explores this further, the research literature exploring the TTM already provides evidence of variable change evident amongst the differing stages. Marshall & Biddle's (2001) meta-analysis found that most of the studies reviewed supported evidence of differing core constructs for each of the stages and change generally occurred in the direction predicted by the theory. However, as this relationship now seems to be confirmed amongst the extensive literature concerning the TTM, the authors argue that further cross sectional studies fail to add any further evidence to the TTM. Rather, they suggest that the progression of the model could be usefully expanded if further research examined the moderators and mediators of stage transition.

3.4.2 The difficulty with cross sectional designs

Research conducted using the TTM has largely been based on cross sectional research studies (Weinstein et al. 1998; Sutton, 2007). Indeed, a review article conducted by Spencer et al. (2002) found that of 73 articles describing population studies in relation to the TTM, 65 of these utilised cross sectional designs. The remaining 8 studies collected data at baseline and follow up but no interventions were involved. Sutton (2007) & Weinstein et al. (1998) have argued that weak cross sectional research designs fail to adequately assess stage transitions. Cross sectional research studies are criticised on a number of different levels. The main criticism levied is that a causal effect can never be obtained, rather researchers are only able to deduce an association between observed variables. Therefore, one is unable to determine if a different stage classification is caused by the actual stage, or if the different strategies of change result in the individual stage classification. Additionally, cross sectional designs can be prone to selection bias and it is difficult to control for all possible confounding variables that may affect behaviour differences (Gomm & Davies, 2000). Further criticisms include the fact that these designs yield little information about the individual, and changes in culture and knowledge can make it difficult to compare studies over time. Whilst cross sectional studies allow an observation that different types of self change processes occur within the different stages, they provide little information on the variables that actually progress individuals through the stages of change. Weinstein and colleagues argues that longitudinal studies would be most effective in determining if matching specific processes to stages effectively increases one's success at changing the behaviour.

The advantages of adopting a longitudinal design framework include its ability to measure individual change over time. This allows the researcher to observe the direction of variables, the stability of the data and the magnitude of change over a temporal time dimension. Moreover, this type of design reduces sampling variability therefore adding an element of control over the confounding variables (Gomm & Davies, 2000).

However, Sutton (2007) has questioned the consistency of the longitudinal predictions of the stage transitions. Sutton reviewed eleven prospective studies and found that whilst some evidence demonstrated that different predictors were related to different stage outcomes, overall there were few consistent conclusions.

Consequently, Sutton recommended that future studies using the transtheoretical model should use shorter time frames, in order to maximise the opportunity to capture the actual stage progressions. Most of the studies Sutton reviewed had long follow up periods of over six months, and whilst Sutton recommended that future studies decrease this follow up period, he also noted that a design of at least six months is necessary to follow individuals from the action to maintenance phases.

3.4.3 The problem with stage targeted interventions

An additional criticism levied at the transtheoretical model is also proposed by Sutton (2007) and concerns evidence from randomised experimental studies using the stages of change framework. Sutton examined the published research on interventions which compared stage matched and stage mismatched interventions. Prochaska and colleagues have effectively argued that stage matched interventions will yield greater success rates as these accurately reflect an individual's readiness to change and will therefore be more acceptable to the individual. Sutton reviewed three research studies (Blissmer & McAuley, 2002; Dijkstra et al. 1998; Quinlan and McCaul, 2000; cited in Sutton 2007) and concluded that these found little or no evidence for the stage model predictions. For example, research conducted by Quinlan and McCaul (2000), examined the role of stage matched and mismatched interventions and an assessment only condition in a college sample of smokers in the precontemplation stage. The stage matched intervention consisted of activities designed to develop smokers' thinking about quitting smoking. The stage mismatched interventions utilised specific action orientated approaches. Their findings demonstrated the opposite effect of the transtheoretical models' hypothesis and found that a greater percentage of stage mismatched individuals progressed an additional stage (54%) when compared to those in the stage matched conditions (30%), however this finding was equivocal. Furthermore, the research showed that significantly more individuals in the mis-matched stage condition attempted to give up smoking than in the matched condition.

Whilst Sutton's criticisms of the TTM in relation to the randomised experiential designs appear valid, these criticisms are only based on only three research studies. This amount does not able one to quantify these findings and therefore

dismiss stage matched interventions as inappropriate. Rather, instead of the TTM providing inadequate translation from theory into practice, the findings may well be a result of the problems inherent in the research cited. For example, Dijkastra et al.'s (1998; cited in Sutton 2007) study examined stage matched and mismatched interventions, and viewed changes in four stages: preparers, contemplators, precontemplators and immotives. Whilst preparers and contemplators were matched to the categories provided by the TTM, precontemplators were classified as those changing in the next five years and immotives were classified as those planning to quit sometime over the five year mark. As this research study used different stages of change to those proposed at the core of the revised TTM, results obtained can not be taken as direct evidence to support their hypothesis. An additional criticism can be levied at Quinlan and McCaul's (2000) research. Their design only used a small sample of 92 smokers. This equates to approximately 30 in each intervention group. This small sample size may not be strong enough to deal with the multivariate analysis required by their research design, and therefore their results can not be accurately substantiated. Finally, Blissmore and McAuley's (2002; cited in Sutton 2007) research was also limited in the fact that many of the smokers' at baseline were already in the action and maintenance stages of the model (57%). The short follow up period of the study would not have allowed smokers in the action stage to progress to the maintenance stage. This may account, in part for their findings.

However, Sutton's criticisms have been given weight by systematic reviews carried out by Bridle et al. (2005) and Riemsma et al. (2003). They first examined the effectiveness of TTM interventions in assisting health behaviour change. The review concluded that interventions based on the stages of change model showed limited effectiveness in facilitating progression. This held true when the interventions were compared to both care as usual and other types of interventions and whether outcomes were examined as stage progression or behaviour change. Whilst the methodological quality of the trials was variable the authors argued that overall evidence for TTM based interventions is weak.

Focusing on smoking health behaviour change specifically, Riemsma et al. (2003) systematically reviewed the evidence base examining stage based interventions for smoking cessation. They found little evidence for the effectiveness of stage

based interventions to promote positive changes in smoking behaviours. However, the methodological trials were criticised for their poor quality and their failure to use validated measurements to measure individual's stage of change.

Whilst it seems that the criticisms levied at the ability of stage based interventions to change health behaviours are valid, they could be argued to be a result of poor experimental methodological designs. A review by Spencer et al. (2002) found that of 22 studies examining the concept of stage matched interventions, only two used an experimental design incorporating randomisation to either control or intervention conditions. These two research studies actually supported the effectiveness of stage based interventions for progressing individuals along the quitting continuum. It therefore follows that if the initial research design is lacking in its quality, for example through inadequate assessment methods, or failure to accurately report the procedure, then the validity of the results is diminished and may be equivocal. For example, Riemsma et al. (2003) criticised the methodological quality of the trials reviewed for not adequately blinding trials, poor follow ups, lack of details about randomisation and failure to report sample size calculations. The same criticisms were consistent with Bridle et al.'s (2005) position. It may be possible that the review findings don't reflect the fact that stage based interventions are ineffective, rather that the research designs utilised to examine this theory are seriously flawed. Only when gold standard designs such as randomised control trials are effectively implemented and reported, containing large sample sizes, and excellent methodology and validated instruments, can we begin to determine the exact success of stage based interventions.

3.4.4 The measurement of the stages debate

An additional criticism levied at the TTM concerns the methods used to classify individuals into a stage of change. An individual's stage of change is normally assessed by a variety of measures which include stage algorithms, forced single item response questions and questionnaires. Davidson (2002) has argued that there are fundamental problems with attempts to define the stages of change and classify individuals and his criticisms are specifically focused on the University of Rhode Island Change Assessment (URICA) questionnaire, developed by Prochaska and colleagues. According to Davidson, the URICA questionnaire has a tendency to ask the same type of question in a number of ways, thus inflating

the internal validity and coefficient α estimates. He therefore argued that the URICA is based on a mathematical quantification of the stages, rather than representing stages that are based on actual psychological constructs. Davidson stated (p.9, 2002) that the URICA is an example of how "psychological meaning can be overlooked in the quest for psychometric perfection."

In relation to the other methods of measuring stage classification, Donovan et al. (1998) in a review of the literature demonstrated that a number of different methods have been used to classify individuals into stages of change, but reliability tests of the measures are scarce. This lack of reliability data may be a result of the inherent qualities of the model, namely the fact that individuals can progress through the stages of change in a matter of days. This makes test-retest reliability estimates over a period of time difficult. Furthermore, Donovan et al. (1998) argue that the use of single item measure to quantify the stages of change is limited as it makes it difficult to use reliability estimates such as Cronbach's α to determine internal consistency. They conclude that additional research is needed to create and evaluate reliable scales for assessing stages of change across differing health behaviours. Bunton et al. (2000) concurs with this argument and suggests that there has been very little critical examination of the questionnaires used to assess stages of change.

Research conducted by Herzog & Blagg (2007) has attempted to address this, and compared the use of a stages of change algorithm with a variety of alternative measures of motivation to quit smoking. Their findings suggest that the algorithm systematically underestimates an individual's motivation to stop smoking, when compared to the alternative measures in use. Their results indicated that individuals in the precontemplation and contemplation stages had similar intentions to quit, therefore forming more of a heterogeneous group than two distinct stages. For example, smokers in the precontemplation stage were classified as having low, medium and high levels of motivation to quit smoking. In addition, those in the contemplation phase were a mix of moderate and high levels of motivation. Etter & Perneger (1999b) found similar results when comparing a single item questionnaire and a five item staging algorithm. They suggested that both questionnaires resulted in smokers being classified in heterogeneous groups and consequently a five stage model may not be realistic.

However, Herzog & Blagg (2007) argued that these findings may be a result of the arbitrary dichotomy that is imposed on the stages of change algorithm across the time continuum. For example, they state that there is no theoretical basis to suggest that individuals who are planning to quit in the next six months are quantitatively distinct to those who are planning to quit smoking in the next five months, or seven months. The authors conclude that consequently there are differences in the conceptual and operational aspects in classifying individuals to a stage of change, and suggest that the initial stages are not quantitatively different. However, they do note that the divergence observed when comparing staging algorithms to other motivational measures in quitting smoking does not quantify which method is the most accurate. It is possible that the stages of change algorithm accurately places individuals in the correct stage, and the other measures all congregate on an incorrect measurement, or this argument could be reversed.

Whilst Prochaska et al. (1992) agree that measuring the stages of change presents a challenge, they advocate the use of a staging algorithm as a series of questions to assess smoking stage classification. They argue that this has been consistently useful in determining an individual's stage of change (DiClemente et al. 1991). Indeed, the staging algorithm appears as the most common stage measurement in the literature and is incorporated in much of Prochaska et al's research (e.g. 1992, 1994, 2004) surrounding the TTM.

3.4.5 Further criticisms of the TTM

Further criticisms have been levied at the TTM and West's (2005) editorial and resulting critical commentaries have fiercely attacked the model's usefulness and scientific validity within the field. West argues that the difficulties with the model are so serious that it is time to discard the use of the model in practice, in order to successfully advance our knowledge of health behaviour change. The criticisms West (2005) cites includes the model is based on the fact that individuals make coherent and secure plans, however evidence indicates that humans do not tend to function in this manner. Moreover, the model's focus on conscious decision making and well thought out planning processes contains no role for other correlates of human behaviour, including learning and reward and punishment. In

addition to the arbitrary lines created to define the stages of change, West argues that the stages contain a mixture of different types of constructs that do not blend coherently together. Finally, West argues that the TTM is "simply a statement of the obvious" (p.1038) as it makes intuitive sense that individuals who want to change are likely to take some action to change and more likely to succeed than individuals who aren't interested in changing.

3.5 Chapter conclusion

The transtheoretical model of change (TTM) consists of three main constructs, the stages of change, the processes of change and the decisional balance of changing. The TTM posits that smokers in different stages of the model will use different processes within each stage and will also view the pros and cons of changing their behaviours in distinct ways. Consequently, the TTM makes predictions concerning which smokers will be more likely to change their behaviours.

Whilst criticisms of the TTM are abundant within the field, evidence to corroborate the critical arguments remains controversial in the literature. The theoretical basis and the predictive value of the model have come under fierce criticism in recent years, yet despite this the criticism is not fully conclusive, largely due to the variable quality of research designs exploring the models constructs and predictions. Indeed it has been argued that most of the published research today attempts to confirm the structure and framework of the TTM and fails to adequately test its ability to explain or predict future behaviours (NHS Health Scotland 2007).

As a result, this study aims to utilise the TTM and address some of the issues raised. For example, this research aims to explore how the introduction of a general smoke-free intervention affects individuals in different stages. Whilst prior work has been conducted concerning stage based interventions, these have not previously explored a nation-wide intervention that affects every individual. If the TTM theoretical predictions hold true, then smokers in the latter stages of the model, who are deemed to be ready for action orientated interventions will change their smoking behaviours more successfully than those in earlier stages, who will

be mismatched to the intervention. Furthermore, the current research will use a longitudinal design, incorporating both a three and six month follow up. This negates the previous criticisms cited concerning the mass of cross sectional research in the field, and also takes account of Sutton's (2007) suggestion that shorter durations should be incorporated into longitudinal designs. The TTM is useful for the current study as it's incorporation of time allows useful comparisons to be made between behaviour carried out before and after the smoke-free intervention. In addition, the TTM makes predictions concerning which individuals are most likely to change as a result of the intervention and therefore provides a further explanatory framework to aid understanding of individual health behaviour change in relation to society wide interventions.

Chapter 4

The present chapter will explore the chosen theoretical model, the TTM, in further depth. This chapter will present a counter argument to using the TTM in interventions and detail the temporal and cyclic process of change. It will be shown that the TTM is a useful predictive tool in determining which smokers are most likely to change their smoking behaviour. In addition the TTM will be explored in relation to smoking bans, however the literature published exploring this context is relatively scarce. The rationale for using the TTM will be detailed and it will be argued that this model is the most appropriate health behaviour change theory for the present research.

4.1 Interventions and the Transtheoretical Model of Change

The transtheoretical model is important in health behaviour change, because it provides a framework to identify individual stages of change and target these with particular interventions. Only stage based models predict that the sequencing of treatments is important (Weinstein, Rothman & Sutton, 1998). Consequently, treatment interventions can be closely matched with the beliefs and behaviours observed within each of the five stages of change. As the intervention is matched with each stage reflecting an individual's readiness to change, it therefore follows that the intervention will be more acceptable to the individual and result in higher success rates (Zimmerman et al. 2000). The amount of progress individuals make in their behaviour change is directly related to the stage they were in at the start of an intervention (Prochaska, DiClemente & Norcross, 1992, Prochaska, 1996). For example, research has shown that smokers who start in the contemplation phase are two-thirds more likely to succeed when compared to smokers who began in the precontemplation stage (Prochaska et al. 1992). Furthermore, when smokers in the preparation stage were compared to those in the contemplation stage, preparators were two-thirds more successful in achieving abstinence (Prochaska, Velicer, Fava, Rossi & Laforge, 1996: cited in Prochaska, 1996). This has also been demonstrated with other health behaviours. In a program for weight control, both stages of change and processes of change were the most important outcomes in predicting in weight loss (Prochaska, DiClemente & Norcross, 1992). These results have strong clinical importance and Prochaska (1996) states that

the goal of interventions should be to move individuals along the continuum by one or two stages, thus resulting in an increase in success at longer term follow ups.

Despite the criticisms levied at designing interventions using the TTM in the previous chapter, the poor experimental designs utilised by the majority of the studies disputes their findings. As Prochaska and colleagues have published conflicting findings using improved experimental designs, it therefore follows that the model, when used within good research methodologies, may in fact support positive outcomes when using stage targeted interventions.

4.2 Temporal dimension of the TTM

In addition to the key constructs described in the previous chapter, another important element of the theoretical model is the temporal construct of change. Velicer et al. (1998) argued that this aspect distinguishes the transtheoretical model from other behavioural change models as it acknowledges and incorporates progress over time. The authors of the TTM have suggested that other theories largely ignored variables concerning changes over time and instead focus on behaviour change as a single event, for example, simply quitting smoking. In contrast the transtheoretical model views change in terms of multivariate outcomes and provides a series of outcome measures. These are viewed as more sensitive than the univariate outcome measures of success measured by other theoretical models (e.g. quitting smoking classified as one construct as observed in the Health Belief Model). The transtheoretical model views change as a process and emphasises the importance of different stages of change that individuals progress through when they attempt to change their behaviour. The model thus provides the ability to detect change and this is demonstrated in the fact that individuals are seen to progress along the self change stages.

The element of change over time makes this model unique and allows the target behaviour to be viewed in a realistic temporal dimension (Velicer et al. 1998). Figure 1 below demonstrates how the temporal dimensions are represented in the model; the initial stages of the model are largely based around behavioural intention, whilst the latter stages concentrate on the actual behaviour implementation.

Figure 1: The temporal dimension of the Transtheoretical model of change*

(Replicated from Velicer, Prochaska, Fava, Norman and Redding (1998).

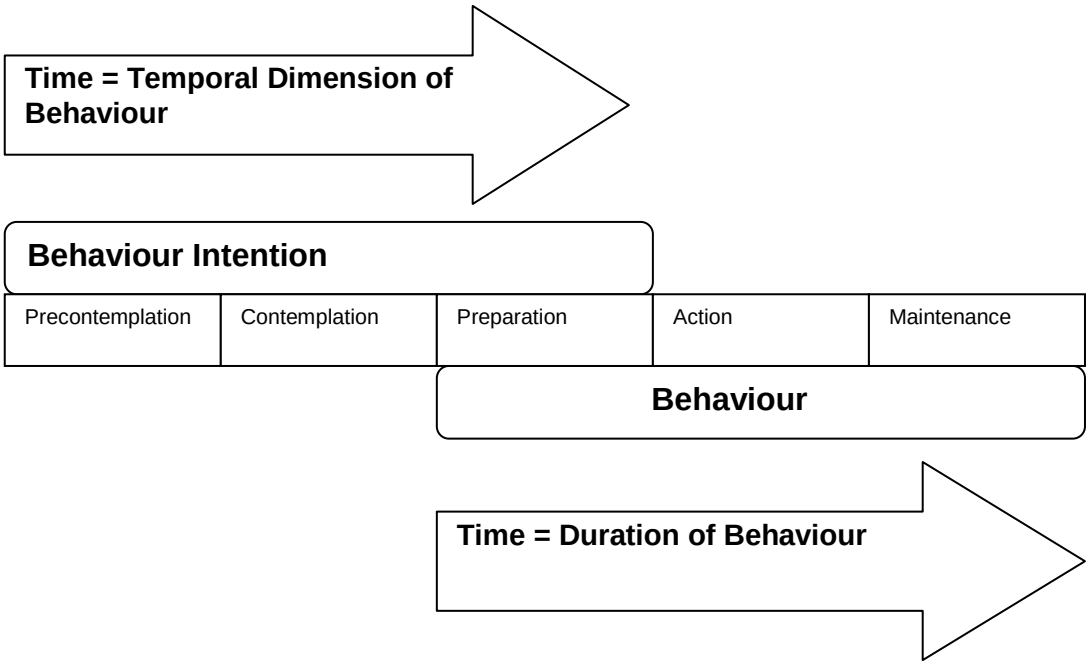


Figure 1 above demonstrates the differentiation between the temporal constructs of behaviour intention and behaviour duration. Prior to the target behaviour implementation, the individual is classified within the behavioural intention stages of the model, precontemplation, contemplation and preparation. The latter stages of change, action and maintenance, classify the individual after behaviour change has occurred and this is measured as duration of the behaviour over time. Figure 1 clearly shows how each of the five stages of change in the transtheoretical model are viewed in relation to progression over time. The inclusion of a temporal dimension is helpful in addressing health behaviour change and is a unique feature of the model.

4.3 The cyclic process of change

Whilst Prochaska and colleagues originally classified behaviour change as a linear progress (DiClemente & Prochaska, 1982), it soon became evident that behaviour change does not simply evolve in a linear fashion. Consequently the authors modified their original proposal and advanced the model to include the concept of relapse. They referred to this as the spiral pattern of change (Prochaska et al.

1992) and acknowledged that individuals taking action to change their behaviour often don't succeed on the first attempt. Rather, relapse is usually inevitable and occurs frequently as individuals find themselves recycling through the stages of change several times before the behaviour change becomes established (Prochaska, DiClemente & Norcross, 1992; Zimmerman, Olsen and Bosworth, 2000). The spiral model of the stages of change is shown below.

Figure 2: A Spiral Model of the TTM

(Replicated from Prochaska, DiClemente & Norcross, 1992)

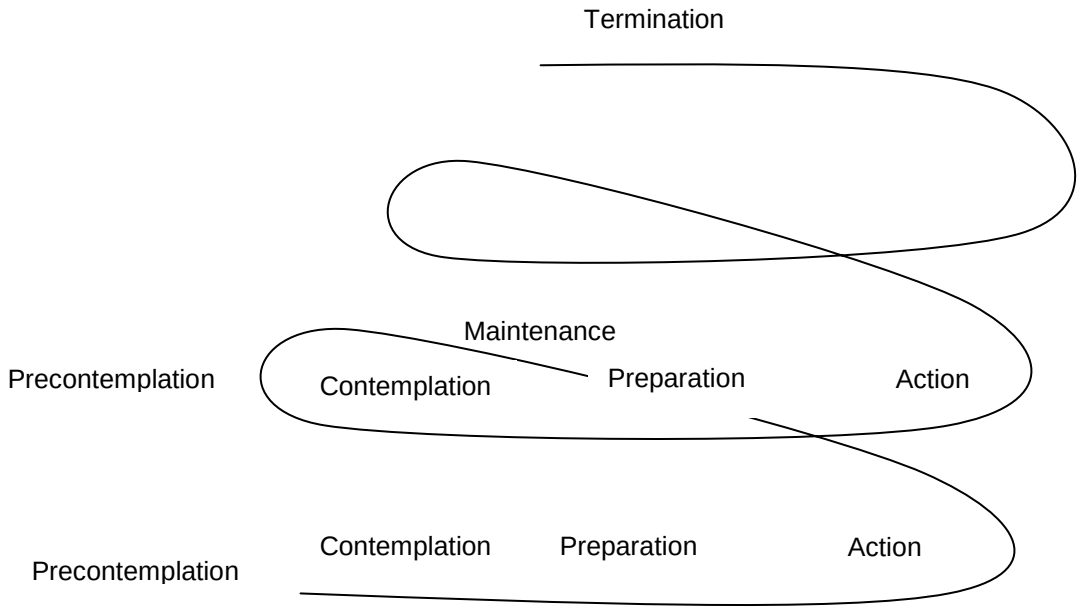


Figure 2 demonstrates the spiral pattern portraying how many individuals move through the stages of change. If we examine the model in relation to smoking, Velicer et al. (1998) has shown that whilst individuals do relapse, only 15% of individuals regress all the way back to the precontemplation stage. Previous research has demonstrated that approximately 85% of individuals attempting to quit smoking recycle back to the contemplation or preparation stages (Prochaska & DiClemente, 1984). Furthermore the spiral model proposed by Prochaska and colleagues reveals that individuals do not endlessly revolve in circles, rather each time individuals relapse, they are able to learn from their previous mistakes and attempt a different technique the next time around (DiClemente et al. 1991). Whilst relapse can be thought of as inevitable in the processes of changing behaviour, it is essential that individuals who do relapse are informed of the

commonality of relapsing and encouraged to learn from their previous attempts. This should promote a successful re-engagement with the progression through the stages of change (Zimmerman et al. 2000). The cyclic nature of the model is important as it describes change as a process and includes the notion of relapse which is a common feature in attempts to quit smoking

4.4 The Transtheoretical Model of Change and smoking bans

Whilst research into the impact of smoking bans and the TTM has not been widely published, Cropsey and Kristeller (2003) examined motivational factors and stages of change in relation to quit attempts after a prison smoking ban. This research is useful in the context of the current study as it provides additional information concerning the psychological constructs involved in behaviour change. Data were collected from male prisoners at three time intervals, prior to the ban, and four days and one month after the ban implementation. Information collected concerned nicotine dependence (Fagerstrom Test for Nicotine Dependence: FTND) and initial stages of change classification (precontemplation vs. contemplation).

Prior to describing the results, it is important to note that the forced abstinence of the smoking ban in both indoor and outdoor areas of the prison may have resulted in a sample resistant to change. The ban resulted in prisoners being unable to smoke anywhere within the prison. Within this sample, the majority of smokers were classified as precontemplators (68.8%). The 31.2% of smokers classified in the contemplation stage were more successful at their quit attempts at time two, however this difference was no longer significant at the final time point of data collection (time three). However, on further examination, the initial part of this finding is rather self explanatory and may be due to flaws in the methodological design of the study. Time two data were collected only four days after the ban implementation. Therefore this cannot be taken as evidence for sustained change in smoking status as a direct consequence of the smoking ban. This is even more plausible due to the findings demonstrating a failure to maintain this significant difference one month after the ban introduction. The short duration between data collection points may be viewed as a flaw in the study design as results may not

accurately reflect how behaviour change is shaped over time as a result of smoking legislation.

Whilst this appears a valid criticism, Cropsey and Kristeller (2003) did report some significant findings using the stages of change classification. Smokers in the precontemplation stage were more likely to disagree with the smoking ban, reported more difficulty in previous quit attempts, increased their smoking rates prior to the implementation of the ban and reported higher scores on the FTND. These results suggest further evidence of different observable behaviours being directly linked to the stages of change classification. However, it would have been useful to further refine this information by including additional stages of change categories in the follow up phase of the research. The addition of further stages of changes classification, such as action and maintenance, may have added to the predictive value of the model. The expansion of the model in this research study could have provided further information describing how the action and maintenance stages of change are related to different behaviours. This extension would have provided useful information on the motivational factors inherent within each stage of change and within the context of environments where smoking has recently been prohibited.

An additional study conducted by Longo et al. (1996) examined the impact of hospital smoking bans on employee smoking behaviour. Two groups were compared, current or former smokers employed in smoke-free hospitals (intervention group), and current or former smokers employed in non smoke-free hospitals (comparison group). These groups were compared for post ban quit ratios and progression along the stages of change continuum. The authors found that employees working in smoke-free hospitals reported higher post ban quit ratios than those in non smoke-free hospitals, (0.506 vs. 0.377), even when adjustments were carried out for confounding variables. In addition, smokers in the intervention group had higher percentages of individuals in the maintenance and action stages of change when compared to those in the comparison group. Furthermore, the intervention group reported lower levels of smokers in the precontemplation stage, when compared to the comparison group. Longo et al. (1996) conclude that the introduction of smoke-free workplaces could greatly improve health care outcomes in employees.

4.5 Rationale for using the TTM for the current study

Whilst the TTM remains a controversial health behaviour change model, it was chosen as the model for the current research project due to a variety of reasons. Firstly, despite some critics suggesting that the model is atheoretical (Bandura, 1997), others argue that the TTM is clearly based on a cognitive behavioural theory and thus retains face validity and validation of its' constructs (Spencer et al. 2002). Moreover, Spencer et al. argue that the model is generalisable as the TTM constructs are supported across different populations and times. In addition, the aforementioned authors argue that the model has good internal consistency, as reported in their review of over 148 articles.

Furthermore, the TTM was initially developed in the realm of smoking cessation. Therefore, the model was designed in relation to a particular health behaviour, and consequently it should be more accurate in defining and understanding smoking and its' relevant behaviour, than models designed for health behaviours in general (Bunton et al. 2000). Secondly, the model contains a temporal dimension, which locates behaviour change in a place and time. This allows a useful framework for understanding that health behaviour change is a process that occurs over time and is useful for the longitudinal design of the current study.

Thirdly, the model understands that behaviour change is not a linear process, but rather is cyclic in nature, paying particular attention to the notion of relapse. Fourthly, whilst the model is widely used in the literature, it has been poorly executed in previous research studies. A literature review conducted by NHS Health Scotland (2007) found that of 239 TTM empirical studies, 179 examined the theory structure, whilst only seven of the studies examined outcomes. The paucity of research testing the predictive qualities of the TTM is concerning considering its ubiquitous use in the health promotion field. Therefore, there is a clear argument for testing the predictive qualities of the TTM and examining outcome, something that this study aims to do.

An additional difficulty with many research studies conducted using the TTM is an overwhelming tendency to 'cherry-pick' out the primary construct, the stages of change variable. Researchers tend to ignore the other constructs of processes of

change and decisional balance and only use the stages to inform their findings. Therefore, they are not testing the model as such, but rather are delivering a variable, rather than theoretically driven study. One cannot claim to measure the TTM model, and yet use only one of the core constructs. Moreover, this variable driven approach adds little to developing the evidence base concerning the predictive ability of the model as a whole. The failure of many researchers to use the full potential of the model to predict behaviour has been criticised by Velicer et al. (1998) as being unrepresentative of the 'real' model. Therefore the current study will aim to examine other core constructs of the TTM in relation to the stages of change and test the full potential of the model.

A final reason for choosing the TTM as the model of health behaviour change in this situation concerns the controversy surrounding the model. Whilst the criticisms of the model are valid, they are not conclusive and therefore we are still uncertain as to which theoretical argument is the most accurate. Indeed Bunton et al. (2000) advise that future research studies should be prospective in design, compare outcomes, and assess before and after evaluations in order to accurately determine the predictive qualities of the TTM. This research study aims to incorporate these suggestions and test the research value of the TTM. Theories should allow professionals to represent and define constructs which are also able to be measured. They should provide a concise background allowing us to investigate relationships between constructs and furthermore allow one to suggest and test interventions for the management of behaviour. The evidence base concerning the TTM remains ambiguous and requires additional well defined research studies to explore the theory further and refute or confirm the models' scientific validity.

4.6 Chapter conclusion

The transtheoretical model of change is useful as the model explains change as a cyclic process occurring over time, replicating the reality of how actual behaviour change occurs. The TTM posits that smokers in different stages of the model will use different processes within each stage and will also view the pros and cons of changing their behaviours in distinct ways. Consequently, the models creators, Prochaska and colleagues, argue that this allows accurate targeting of particular interventions dependant on an individual's readiness to change. Whilst research

exploring the TTM in relation to smoking bans is relatively scarce, the evidence suggests that smoking bans may result in progressing smokers along the stages of change continuum, and that individuals in different stages will present alternative smoking behaviours.

The TTM is a useful explanatory framework for exploring the impact of smoke-free legislation for a number of reasons. Firstly, the fact that it was designed for specific use with smokers should allow focused translation of the model into practice. In addition, the model accounts for the passage of time and should therefore allow accurate interpretations of smoking behaviours before and after the ban implementation. The TTM also makes predictions concerning which individuals will be more likely to change their smoking behaviours. Therefore, it will be of interest to observe if the smoke-free intervention will only impact positively on those individuals who are ready for a more action orientated approach to behaviour change. Finally, as the TTM focuses largely on individual cognitive processes, it will be of interest to observe how a society wide intervention banning smoking will alter individual thoughts and behaviours. Whilst the traditional use of the TTM has been to focus interventions on an individual basis, little work has been carried out to assess how societal determinants of behaviour, such as blanket interventions, will alter individual behaviour.

Chapter 5

Psychological constructs

This chapter will briefly discuss the choice of measures used in the current research project. It will detail the rationale for choosing each measure in order to examine the core psychological constructs. Further information on the content, validity and reliability of the measures will be provided in the methodology section.

5.1 The stages of change

Prochaska et al. (1992) advocate the use of a staging algorithm to establish smoking stage classification. They argue that this has been consistently useful in determining an individual's stage of change (DiClemente et al. 1991). Moreover, it is the most common stage measurement in the literature and is incorporated in much of Prochaska et al's research (e.g. 1992, 1994, 2004) surrounding the TTM. The algorithm is easy to administer, quick to complete and can be collected in a self report format. Consequently this algorithm is highly suited to the current research design.

5.2 The processes of change

Processes of change were measured with the use of the *Self Change Strategies (SCS)* questionnaire (Etter, Bergman and Perneger 2000). This self report questionnaire measures five types of self change strategies utilised by current smokers: *Commitment to change; Taking control; Risk assessment; Helping relationships* and *Coping with the temptation to smoke*. These strategies are equivalent to the processes of change inherent within the TTM as they describe the different cognitive and behavioural processes or strategies that individuals employ when changing smoke related behaviours.

The SCS questionnaire was chosen in place of Prochaska et al.'s *Processes of Change Scale (POC)* as it is specifically designed for use in a smoking population, whereby Prochaska's scale is intended for use with a variety of health behaviours. In addition, the use of the SCS questionnaire allows one to further explore and test the theoretical premises of the TTM. The POC scale assesses self reported

usage of behaviour change processes, and the SCS also measures processes of change. Both of these scales essentially describe the cognitive behavioural methods that individuals use in each of the five stages of change, and different processes are emphasised at different stages (Perz, DiClemente & Carbonari 1996; Munro et al. 2007). In addition, the TTM proposes that the use of different processes are important predictive variables of stage progress (Prochaska, DiClemente & Norcross, 1992). If the processes of change is a valid concept, and is observed in the POC scale analysis, it therefore follows that other measures of behaviour change strategies should identify similar responses and predictions. For example, different use in patterns of self change strategies should be observed at distinct stages of change. Additionally the model hypothesises that different strategies may act as predictor variables in progressing an individual along the stages of change continuum. If these hypotheses can be supported utilising a different measurement of processes of change, essentially measuring the same underlying theoretical concept, this would provide further support for the validity of the TTM's constructs.

Therefore, the responses of the SCS should follow the hypothesis of the TTM and observe the use of different processes of change at distinct stages. Strategies including *commitment to change* and *risk assessment* are cognitive strategies and should therefore be seen in the earlier stages of the model, precontemplation and contemplation. Conversely strategies incorporating behavioural elements should be observed in the later model stages, with *taking control* and *helping relationships* scores seen more frequently in the preparation and action phases of the model. *Coping with the temptation to smoke* incorporates both elements of cognitive and behavioural processes. Within the coping sub-category, the use of cognitive strategies is seen in Q17, *"To deal with cravings for cigarettes I concentrate on other things."* Behavioural strategies can be observed in Q18, *"I keep busy to overcome the urge to smoke."* and Q19, *"I take deep breaths to fight off the desire to smoke."* As this subcategory of the SCS incorporates both cognitive and behavioural elements, this construct may be equally distributed and observed across the stages.

5.3 The decisional balance construct

Prochaska and colleagues argue that individuals at different stages of the TTM will have different beliefs, attitudes and motivations with respect to their smoking behaviours (Prochaska et al. 1988; DiClemente et al. 1991). In relation to the stages of change and the implementation of the Scottish smoking legislation, research suggests that attitudes towards smoking should be different for those in distinct stages of change and may change over time as a result of the legislation. Etter et al. (2000) have developed a useful self report questionnaire measuring individuals' perceptions of the *adverse effects of smoking*, the *psychoactive benefits of smoking* and the *pleasure of smoking*. The *Attitudes Towards Smoking Scale (ATS-18)* is similar to the *Decisional Balance Scale* promoted by Prochaska and colleagues. Their questionnaire basically covers the concepts of the advantages, or pros, and disadvantages, or cons, of changing a behaviour. One could argue that Etter et al.'s questionnaire measures the same constructs, as adverse effects of smoking can be viewed as the cons, and psychoactive benefits and pleasure of smoking seen as the pros of maintaining smoking behaviours. The ATS-18 was decided upon for the current study as it is specifically designed for use with a smoking population.

If the TTM main theoretical constructs hold true, we should be able to observe the same pattern of behavioural responses hypothesised by the model's decisional balance construct with the use of the SCS questionnaire. Therefore, smokers in the earlier stages of change should view the pros of changing a behaviour as low, and the cons of changing a behaviour as high. Thus one would expect smokers in the precontemplation and contemplation stage to have high scores on the SCS responses of *pleasure and psychoactive benefits of smoking*. Furthermore, smokers in the preparation and action stages should show lower scores on these responses and higher scores on the *adverse effects of smoking response*. Using alternative measures to examine the core predictive constructs of the TTM should support the existence of these constructs and provide further evidence for their existence.

5.4 Addiction/ Nicotine dependence

Previous research has indicated that the construct of nicotine dependence is important in understanding the maintenance of smoking behaviours and may be

an important matching variable for treatment outcomes (Burling et al. 1997; Hughes, 1984, 1996: cited in Burling and Burling 2003). Indeed research conducted by Farkas et al. (1996) found that addiction responses were better at predicting smoking cessation at follow up when compared to the predictions of the stages of change model. Therefore, addiction is a useful concept to measure because it may allow further examination of the role of nicotine in promoting smoking behaviours and may add predictive weight to the findings. This biological influence may be a further determinant of smoking behaviour change. Therefore, addiction was measured in the current study and was conducted with the use of the Fagerstrom Test for Nicotine Dependence (FTND), (Heatherton et al. 1991).

The concurrent nature of the FTND scale containing items to measure both dependency on nicotine and behavioural measures of smoking, may be useful in gaining further insight into the nature of smoking. Behavioural responses of the scale include *finding it difficult to refrain from smoking* or *smoking when ill*. Items which measure dependency includes: Q1. *How soon after you wake up do you smoke your first cigarette?*; and Q5. *Do you smoke more frequently during the first hours after waking than the rest of the day?*

If we examine the predictions of the TTM in relation to nicotine dependence, we should observe that smokers in the preparation stage of the model are less addicted to cigarettes (DiClemente et al. 1991), and that those in the precontemplation stage are most addicted to cigarettes. In addition, individuals in the contemplation stage should fall midway between these two stages in their addiction to nicotine scores (Fava, Velicer & Prochaska, 1995).

5.5 Chapter conclusion

In terms of the experimental design of the current research project, the smoking ban is included in the study design as an independent variable. The dependent variables are stages of change membership, processes of change and the decisional balance construct. A measure of addiction is added as a further explanatory variable and is an additional dependent variable. The current study aims to measure the effect of the smoking ban on the stages, processes, and pros and cons of changing smoking behaviours. As the TTM allows theoretical

predictions based on the stages of change concept, hypotheses are formed concerning the use of specific cognitive and behavioural processes observed at different stages. Moreover further hypotheses can be produced concerning which individuals are more likely to progress along the stages of change continuum. The detailed research aims and objectives of this study will be given in the following chapter.

Chapter 6

Research aims, questions and hypotheses

This chapter will detail the specific research aims, questions and hypotheses of the current research project, based on the previous literature review. Hypotheses formed from the predictions of the literature will also be presented.

6.1 Research aims

- To establish if the introduction of the smoking ban results in lower levels of daily cigarette consumption and increased quit attempts in Scottish smokers
- To explore how the introduction of the smoking ban alters Scottish smokers attitudes and views towards the ban
- To conduct a prospective longitudinal study of the effects of the Scottish smoke-free intervention on smokers' behaviours using the core constructs of the TTM; stages of change, processes of change and the decisional balance.
- To investigate how individual's stage membership may alter in light of the implementation of the smoking ban.

6.2 Research questions

- Does the implementation of a smoking ban alter Scottish individuals' smoking behaviour and attitudes?
- Are processes, and pros and cons, of changing smoking behaviour, observed in different patterns dependent on stage membership?
- Does the smoking legislation impact on smokers stages of change progression?

6.3 Research Hypotheses

It is hypothesised on the basis of the existing research literature that:

1. Scottish smokers should report an increase in quit attempts, and a decrease in cigarette consumption as a result of the smoking ban implementation.
2. Positive attitudes in relation to support for the ban will increase over time

3. As different processes of change are observed at distinct stages of the TTM, higher use of cognitive strategies will be reported in the earlier stages of the model, and strategies incorporating behavioural elements will be reported more frequently in the later model stages.

4. Smokers in the earlier stages of change will view the pros of changing their behaviour as low, and the cons of changing their behaviour as high. In the latter stages of the model, the reverse pattern should emerge showing higher levels of pros and lower levels of cons reported in relation to changing smoking behaviour.

5. As a result of the smoke-free action orientated intervention, smokers in the preparation stage of the model will demonstrate further stage progression than those in the precontemplation or contemplation stages of the model.

6. The smoking ban intervention will influence individuals' progress towards quitting smoking and increase progression along the stages of change continuum.

7. Smokers in the precontemplation stage of the model will be most addicted to cigarettes, followed by those in the contemplation and preparation stages.

Chapter 7

Methodology

The current chapter reports on the study design utilised, and details information on participant inclusion and exclusion criteria and sampling methods. The measures used in this research project will be introduced and discussed. Finally, the methodological procedure of the research will be detailed in full.

7.1 Design

This study received ethical approval by the Queen Margaret University (QMU) ethical committee. Ethical agreement was granted in concordance with the principles of good research practice and included concepts such as anonymity, confidentiality, informed consent, data protection and storage. The researcher was bound to retain individual confidentiality for each participant and their responses would remain anonymous, only identifiable by a unique numerical code. Participants would be provided with written and verbal information prior to gaining consent. This covered information concerning what the study was about, how they would be involved, and details of an independent source they could contact for questions or concerns they had about the project. Participants were given time to grant consent and informed that taking part was voluntary and they were able to drop out of the research at any time without providing any reason. In addition, identifiable data was stripped from individual data folders and all data were stored in a locked filing cabinet.

The present study incorporates a repeated measures natural experiment design. Data were collected using a within subject method at three time points: prior to the implementation of the Scottish smoking ban (Time 1: T1), and at three (Time 2: T2) and six months (Time 3: T3) after the introduction of the ban. Unfortunately due to the quasi experiment nature of this research and the financial resources available, no control group was able to be utilised. Participants were initially recruited face to face at T1. Data collection packs were sent to participants' home addresses at T2 and T3. The independent variable being examined is the Scottish smoking legislation. Dependent variables include Scottish smokers' behaviours and attitudes towards smoking and the legislation.

7.2 Participants and sampling

Scottish smokers currently residing in Scotland were invited to take part and the self selecting convenience sample was recruited from a number of different settings. Exclusion criteria for the study included non smokers, smokers under the age of 18 years, non-fluency in English and neurological or physical impairments that would impede self report questionnaire assessment.

Sampling took place in a variety of settings; smokers were approached around hospitals, work places, outside bars and from places of further education in Scotland. In addition a snowballing sampling method was utilised. If willing, smokers and non smokers who did not wish to take part were asked to transmit the data collection pack and study information to any smokers they knew. Consenting participants were also asked to refer other smokers to take part in the study.

As the current research project is collecting innovative data, it was difficult to complete a power analysis for the study. This is largely due to the lack of information in the literature concerning the effect size one is likely to find from the variables in the current population. In addition, a multivariate framework containing many variables was utilised for the current project. This framework made it difficult to assess each type of statistical test as an individual unit, as it may have led to unrealistic or incorrect estimations (Rudestam & Newton 2001). Due to these methodological concerns, sample size requirements were estimated from a computer based sample size calculator (www.raosoft.com/samplesize.html) which utilised general statistical rules of thumb to ascertain the number of participants required. This sample size calculator required the researcher to enter desired figures for the following: margin of error, confidence level, population size and response distribution. The values entered for the current project are detailed below.

7.2.1 Margin of error

A margin of error of five per cent is a common choice for investigators. However, if responses are likely to be skewed, investigators can tolerate a higher number of error than if one expects an evenly split distribution (Raosoft 2003). In light of the

innovative nature of the current project and the type of data being collected, the researcher hypothesised that the data collected may be skewed, therefore allowing the researcher to allocate a higher margin of error. Margin of errors of both seven and eight percent were entered in order to determine sample size for two possible margins of error.

7.2.2 Confidence level

Based on commonly used statistical principles, and common interpretations of these in the psychological world, the confidence level for the current study was set at 95%. This figure provides a plausible range for our estimate of the true treatment effect given the size of the difference actually observed. So, one would expect that 95% of the time, properly constructed confidence intervals should contain the true value of the variable of interest (Davies, 2003).

7.2.3 Population size

In line with the recommendations of the sample size calculator, the population size was set at 20,000. Whilst the number of smokers in Scotland far exceeds this figure, the recommended figure of 20,000 was advocated by the calculator software producers. Raosoft (2003) proposes that population estimates don't vary much with populations over 20,000.

7.2.4 Response distribution

Again, in line with the recommendation of the sample size calculator producers (Raosoft, 2003), this figure was set at the most conservative estimation of 50%. This is particularly recommended for studies in which the expected response distribution is still unclear.

Based on the two different margins of errors calculated, the researcher was able to determine a required sample size of 195 participants (7% margin of error). If a higher margin of error was found to be acceptable, a sample size of 149 participants would be required for a margin of error of 8%. Whilst the latter figure may be appropriate for validating data at T2 and T3 phases of the data collection (due to drop out rates), the current researcher accepted an initial margin of error at 7% and therefore aimed to recruit 195 participants in total.

7.3 Measures

7.3.1 Smoking Behaviours Questionnaire

Smoking behaviours, attitudes towards the ban and stages of change

The researcher developed a simple self report, the Smoking Behaviours Questionnaire (Appendix 1) to assess further smoking behaviours and variables of interest in the current study. The questionnaire collected further information concerning three main constructs: smoking behaviours, attitudes towards the smoking ban and an individual's stages of change classification. This measure was developed after a review of the existing resources used to assess these constructs. Whilst individual measures were available to collect information concerning the various smoking variables, no one questionnaire covered all of these aspects. Therefore, in order to ease data responding for participants, the researcher synthesised the available methods and collated questionnaire items together in one measure. This questionnaire was designed to gain information on important individual variables that have been demonstrated in the literature to influence smoking behaviours and attitudes. For example, information concerning smoking demographic information, cigarette consumption and quit attempts have previously been used to inform research practices (e.g. Chapman et al. 1999; Fichtenberg & Glantz 2002 & Longo et al. 1996) and explore relationships between smoking variables and outcomes. In addition, the questions concerning information on attitudes towards the smoking ban were adapted from research previously conducted within the area (e.g. Gallus et al. 2006 & La Vecchia et al. 2001). Moreover, the last variable of interest, participants' stages of change was collected using the stage algorithm as proposed by the TTM founders Prochaska and DiClemente (e.g. DiClemente et al. 1991 & Prochaska et al. 1992).

Whilst the questionnaire collected information on the same constructs at each time interval, modifications were made to the questionnaire for T2 (Appendix 2) and T3 (Appendix 3). These modifications illustrated changes to the questionnaire wording to reflect the change in the time intervals (e.g. Q10: *If you have tried to stop smoking in the last three months...* (T2) and, *If you have tried to stop smoking in the last 6 months...* (T3). In addition items that were only relevant at the baseline phase of data collection, (e.g. Q4: How old were you when you first started smoking cigarettes?) were excluded in T2 and T3 phases of data

collection. Additional information on the type of data collected for each construct of interest is further detailed below.

1. Smoking behaviours

This section of the questionnaire included questions assessing the amount of cigarettes smoked, how long individuals had been smoking for, where most of their cigarettes were smoked, smokers' quit attempts, methods used to quit, and information on any smoking restrictions in their households. Responses were recorded by checking a box indicating an answer or by recording a direct response to the question.

2. Attitudes towards the smoking ban

Support for the Scottish smoking ban was assessed by a question asking respondents to indicate what they felt the smoking policy in Scotland should be. Responses were denoted on a five point Likert scale and ranged from *a complete ban on smoking indoors* (score of 1) to *no smoking restrictions* (score of 5).

3. Stages of change

The smoking behaviour algorithm contained questions to classify smokers according to Prochaska & DiClemente's (1983) stages of change model. The stages of change were considered in relation to the Scottish smoking ban and this was taken as a focal point for quit attempts. For example at T1, smokers were asked if they were planning to stop smoking prior to the ban implementation, and if they were planning to stop smoking in the 30 days after the smoking ban was enforced. Responses were given by ticking a check box in a simple yes/ no format. In accordance with strategies used by Etter et al (2000), and advocated by Prochaska, Norcross & DiClemente (1994) & Prochaska et al. (2004), smokers who were not seriously considering stopping smoking within the next six months were in the precontemplation stage. Smokers who were aiming to quit smoking within the next six months were classified in the contemplation stage. Scottish smokers who indicated that they were planning to quit smoking in the 30 days after the ban enforcement were categorised in the preparation stage. At T2 & T3 slight modifications were made to these questions in order to reflect the change in time since the introduction of the smoking legislation. In addition, a further stage of

change was also assessed, and ex-smokers who had quit smoking in the preceding months after the implementation of the ban were classified in the action stage. Prochaska et al. (1994) argue that behaviour change maintained for a period of six months fits within the maintenance stage of the model; however as data collection was terminated at six months, this element of the stages of change model could not be formally assessed.

7.3.2 Self change strategies for current smokers (SCS-CS) Questionnaire

Processes/ strategies of change

Assessment of the frequency of self change strategies used by current smokers was measured with the use of the Self Change Strategies for Current Smokers Questionnaire (SCS-CS) (Appendix 4) developed by Etter, Bergman and Perneger (2000). Permission to use the scale was granted in writing by the author. All individuals at T1 and individuals who were still smoking at T2 and T3 completed the SCS-CS. This19 item self report questionnaire measures five types of self change strategies utilised by current smokers. Reponses are scored on a five point Likert scale ranging from *never* (score of 1) to *all the time* (score of 5).

The subscales are calculated as individual totals, providing a score for each of the five self change strategies. These strategies consist of *Commitment to change,* which includes questions concerning reassessing the disadvantages of smoking and the decision to quit. *Taking control* includes items related to self control of one's habit. *Risk assessment* examines questions assessing the risks that smoking may be having on an individual's health. *Helping relationships* contains items on social support seeking behaviours, and *Coping with the temptation to smoke* assesses use of particular coping strategies. Across all of the self change strategies, higher scores indicate more frequent use.

Despite the fact that the scales contain a small number of items, Cronbach α coefficients for the subscales ranged from 0.73 to 0.87, demonstrating good levels of internal consistency. As shown all of the coefficients for each subscale exceeded the recommended criterion level of alpha = 0.7 (Nunnally & Bernstein, 1994). In addition, acceptable test-retest reliability coefficients were obtained for

the subscales with scores ranging from 0.59 to 0.86 (Etter et al. 2000). The scale was developed from an initial qualitative phase of data collection. As the scale contains all of the main categories of qualitative data initially identified, it retains good content validity. Moreover, the scale was found to have predictive validity, with a relationship demonstrated between self change strategies and smoking cessation at one month, which is useful for the current study.

7.3.4 Attitudes towards smoking scale (ATS-18) Questionnaire

Decisional balance – pros and cons of smoking

Attitudes towards smoking were measured with the Attitudes Towards Smoking Scale (ATS-18) (Appendix 5), an 18 item self report questionnaire (Etter, Humair, Bergmand and Perneger, 2000). Permission to use the scale was granted in writing by the author. Participants indicated their answers on a five point Likert scale with responses ranging from *Totally disagree* (score of 5) to *Fully agree* (score of 1).

Factor analysis of the ATS-18 questionnaire resulted in three factors or composite scales: perceptions of the adverse effects of smoking; perceptions of the psychoactive benefits of smoking and perceptions of the pleasure of smoking. Two of these subscales (perceptions of the psychoactive benefits of smoking & perceptions of the pleasure of smoking) measure perceived advantages of smoking, and the remaining domain measures the perceived disadvantages of smoking (adverse effects of smoking). However, the authors have acknowledged that further discriminant analysis is needed to determine if the positive aspects of the scale indeed categorise two separate dimensions.

Whilst the scale does not provide a total score, individual scores for attitudes across the three domains can be calculated. In addition researchers can compute a differential score of advantages of smoking minus disadvantages. This differential score has been shown to predict both smoking relapse and smoking cessation at 16 months (Etter et al. 2000). Internal consistency coefficients for the scale have been demonstrated to be high, with coefficients of 0.85, 0.88 and 0.81 respectively for the three domains (Ibid).

Whilst the ATS-18 was published in 2000, to date very few studies have employed the scale to examine attitudes towards smoking. However, with high reliability and validity ratings and a sound factorial structure, this questionnaire is highly suited for the current study. It has been found to be positively associated with stages of change (Etter et al. 2000) and therefore provides a useful additional tool for exploring the relationship between attitudes towards smoking and the stages of change classification.

7.3.5 Fagerstrom Test for Nicotine Dependence (FTND) Questionnaire

Addiction

Nicotine dependence was measured with the Fagerstrom Test for Nicotine Dependence (FTND) self report questionnaire (Heatherton, Kozlowski, Frecker & Fagerstrom, 1991) (Appendix 6). This measure is an improved revision of an earlier Fagerstrom Tolerance Questionnaire and has been shown to have improved internal consistency with reliability levels of 0.61 (Ibid), an improved factor structure and better external validity (Burling & Burling 2003). Additional studies examining the use of the FTND have reported similar internal consistency scores of 0.59 (Ibid), 0.70 at baseline and 0.67 at follow up (Etter, Vu Duc & Perneger 1999). Whilst most of these internal consistency score do not reach the recommended alpha of 0.70 (Nunnally & Bernstein, 1994), one must take into account the small number of scale items which impact directly on the achievable alpha results. As internal consistency is dependant on test length, with fewer items generally indicating a lower reliability score, this six item questionnaire demonstrates an acceptable internal consistency for the study purposes. Moreover, particular items on the questionnaire, mainly *Cigarettes per day* (CPD) and *Time to the first cigarette of the day* (TTF) have been shown to significantly correlate with biochemical indices of heaviness of smoking (Heatherton et al. 1991, Burling & Burling 2003), therefore implying good validity.

The FTND is a self report instrument whereby participants are instructed to check the box indicating their response. It is easy to administer and quick to complete and score. The questionnaire provides scores for nicotine dependence ranging from very low addiction (scores 0-2) to very high addiction (scores 8-10). Participants who score six or greater have previously been categorised as highly

dependent on nicotine (Chabrol, Niezboral, Chaston & De Leon, 2005). A review of the literature demonstrates that the FTND scale is a widely used assessment tool (e.g. Etter, Vu Duc & Peregner 1999; & Heatheron et al. 1991). It has been found to be suitable for a variety of settings (Sledjeski, Dierker, Costello, Shiffman, Donny & Flay, 2007) and reliable for the purpose of assessing nicotine dependence (Pomerleau, Carton, Lutzke, Fressland & Pomerleau, 1994).

7.4 Procedure

After approval from the ethical committee, questionnaires were piloted to assess ease of clarity and recording of responses. Colleagues from a work environment (N=6) were asked to complete the questionnaires as a dummy run. This allowed the researcher to pilot the ease of completion of the questionnaires, to ensure all questions were unambiguous, and that response formats were easy to understand. Slight modifications were made to the smoking behaviour questionnaire in order to clarify ease of responding and question intent. The piloting phase was completed prior to the first phase of official data collection.

T1 data was collected in February and March 2006, T2 data was collected in June/ July 2006 and the final phase of data collection (T3) took place in September/October 2006.

Time 1 (T1)

T1 data was collected in the two months leading up to the Scottish smoking legislation. Informed consent of participants was requested face to face after potential recruits had initially been approached by the researcher. The researcher asked for a few moments of their time, briefly informed them of the research projects and invited them to participate. If participants declined, no further contact was made. If the participant displayed an interest, an Information Sheet (Appendix 7) was circulated to smokers and they were provided with the opportunity to ask questions or clarify points concerning the study. Informal consent was declined or provided by the potential recruit and, if granted, written consent was obtained on the Consent Form (Appendix 8). Participants either completed the questionnaires there and then, or if timing was an issue, were provided with a stamped addressed envelope to return the questionnaires to the researcher.

Approximately three-hundred-and thirty individuals were initially approached with 240 individuals agreeing to participate. Data collection packs containing the self report questionnaires were distributed face to face to the sample and either completed at the time, or posted back to the researcher.

Time 2 (T2)

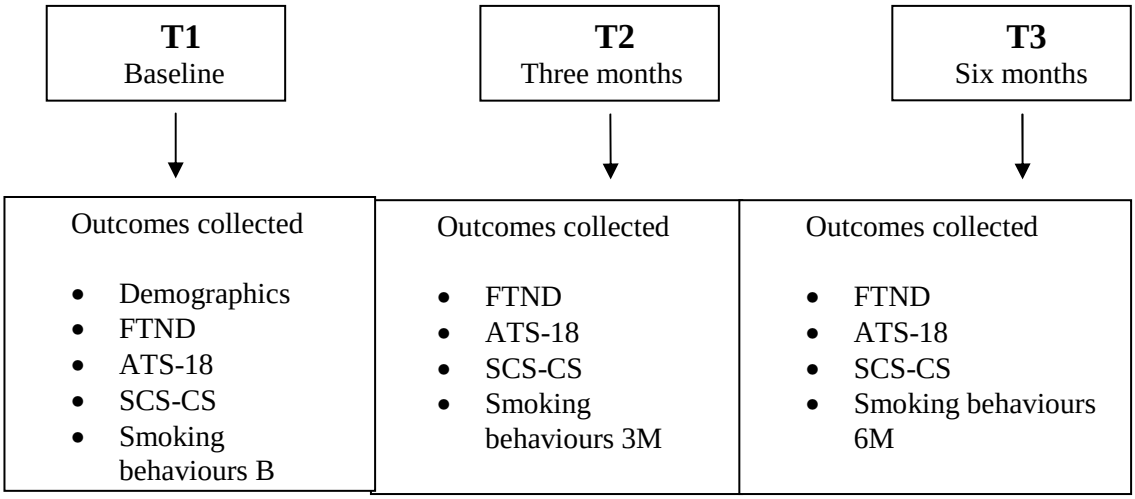
T2 data were collected approximately three months after the Scottish smoking legislation was enforced. Data collection packs were posted directly to the volunteers approximately two weeks before the exact three month follow up date. Envelopes were hand written and packs included a three month cover letter (Appendix 9) containing instructions for completion of data. Packs also contained a SAE for ease of return. If packs had not been returned in the two weeks after the follow up date, the researcher telephoned participants to request the data. If participants indicated that they no longer wished to take part, they were dropped from the study and no further contact was made.

Time 3 (T3)

T3 data were collected approximately six months after the Scottish smoking legislation was enforced. Data collection packs were posted directly to the volunteers approximately two weeks before the exact six month follow up date. Envelopes were hand written and packs included a six month cover letter (Appendix 10) containing instructions for completion of data. Packs also contained a SAE for ease of return. If packs had not been returned in the two weeks after the follow up date, the researcher telephoned participants to request the data. If participants indicated that they no longer wished to take part, they were dropped from the study and no further contact was made.

In order to clarify the exact procedure for data collection, the Figure 3 below demonstrates measures collected at the protocol time intervals of the study design.

Figure 3: A flow chart showing the outcomes collected at each time interval of the project.



As Figure 3 above shows, demographic information was only collected at T1. The same measures were taken at T1, T2 and T3 in order to quantify the direct change in behaviour. However, slightly different versions of the smoking behaviour questionnaires were given out at each time interval in order to change wording related to timing of the ban.

Information which could identify responses to individual participants was stripped from the original data collection packs and stored separately. Each individual was given a unique three digit identification code (001, 002 and so on) to ensure participant identities were kept confidential. Data were stored in a locked filing cabinet and will be retained for five years after publication, in line with BPS ethical guidelines.

Chapter 8

Results

Data obtained from the current research project was entered into SPSS, Version 15.0, in order to address the research questions and hypotheses detailed in Chapter 6. Data were screened and cleaned and any data entry errors were checked against the raw data and if necessary, re-entered correctly into the data set. Each participant was given a unique ID number to identify their responses, and following ethical guidelines, individual's confidential data was not included in the electronic data set. Whilst the data analysis was carried out in a systematic manner utilising a variety of statistical analyses, it is acknowledged that multi-level analysis may have been more appropriate in handling the limited data.

8.1 Response distribution

Of the 240 research packs distributed, 127 were returned at T1, (52.9%), 88 were returned at T2 (36.7%) and 55 were returned at T3 (22.9%). An ordinal regression analysis was used to fit a proportional odds model for data returned at T2 and T3. This was chosen instead of a multinomial logistic regression model as an ordinal model took into account the ordering of the variables which provided further power for the analysis (Tabachnick & Fidell 2001). The ordinal regression model was used to analyse the data to determine if predictor variables including age, gender, education, martial and employment status predicted which participants would be most likely to return the data packs at follow up. Essentially the regression model assessed whether respondents who dropped out of the research differed to those who remained within the study. At T2, a total of 120 cases were analysed (missing n = 7) and the full model was found to be an acceptable fit for the data (chi-square = 3.30, df = 5, p = .654). Table 2 below shows the coefficients, the Wald statistics, associated degrees of freedom and probability values for each of the predictor variables at T2.

Table 2: Ordinal regression output showing variables contained in the model at T2

Parameter estimates	Coefficient estimate	Wald statistic	df	Significance level
Age	-.145	.702	1	.402
Sex	-.303	.512	1	.474
Employment	-.285	1.599	1	.206
Marital status	-.126	.088	1	.767
Education	-.009	.002	1	.963

As shown in Table 2 above, none of these descriptive variables were significant in predicting which participants were most likely to return their data at T2. Therefore missing data appeared to be unrelated to any predictor variables and drop out reasons may be at random.

At T3, the same analysis was completed and a total of 120 cases were analysed (missing n = 7). The full model was found to be a good fit for the data (chi-square = 2.12, df = 5, *p* = .833). Table 3 below shows the coefficients, the Wald statistics, associated degrees of freedom and probability values for each of the predictor variables at T3.

Table 3: Ordinal regression output showing variables contained in the model at T3

Parameter estimates	Coefficient estimate	Wald statistic	df	Significance level
Age	-.043	.073	1	.788
Sex	-.114	.086	1	.769
Employment	-.197	.824	1	.364
Marital status	-.438	1.211	1	.271
Education	-.141	.584	1	.445

As shown in Table 3 above, none of the predictor variables were significant in predicting which participants were most likely to return their data at T3. Therefore missing data at both T2 and T3 appears to be unrelated to these descriptive variables and participants who dropped out of the study can not be predicted by age, sex, education, marital and employment status. The lack of existence of significant relationships between the dependent variable (data returned) and the independent (or predictor) variables was thus supported at both T2 and T3 of data collection.

8.2 Characteristics of the sample

Table 4 presents information on the sample and provides a number of relevant demographic and smoking variables. Information is presented for all three time intervals.

Table 4: Characteristics of the research sample

	Time Intervals		
Variable	**T1**	**T2**	**T3**
Sample size (n)	127	88	55
Age			
Mean (SD)	37.96 (12.0)	38.7 (12.1)	37.9 (11.8)
Gender (n)			
Females	80 (63%)	54 (39%)	33 (40%)
Males	47 (37%)	34 (61%)	22 (60%)
Marital status (n)			
Married/ living with partner	71 (56%)	52 (59%)	33 (60%)
Single/ divorced/ widowed	56 (44%)	36 (41%)	22 (40%)
Education level (n)			
Low	50 (41%)	34 (41%)	20 (37%)
Intermediate	38 (31%)	28 (34%)	19 (35%)
High	33 (28%)	21 (25%)	15 (28%)
Employment status (n)			
Full time	92 (72.4%)	67 (76%)	40 (73%)
Part time	17 (13.4%)	13 (15%)	6 (11%)
Unemployed/ retired/ student	18 (14.2%)	8 (9%)	9 (16%)
Age started smoking			
Mean (SD)	15.67 (3.4)	15.59 (3.2)	15.84 (2.6)
Median	15	15	16
Cigarettes per day			
Mean (SD)	17.3 (8.1)	17.2 (9.8)	17.1(10.6)
Median	16.4	16.4	14.9

As observed in Table 4, there are very few differences in the sample demographic and smoking characteristics over time. Despite the high number of individuals

who dropped out at T2 and T3, this appears to have had relatively little impact on the overall demographic characteristics of the sample. The main difference is observed in gender, at T1 there was a higher proportion of female participants than male participants. However, this trend was reversed at T2 and T3 with a higher percentage of males than females returning the data packs. At all time intervals, the majority of the sample were married or living with a partner (54%). Most of the participants reported a low (Standard grades) to intermediate (Highers) level of education, and the majority were in full time employment. Little change was observed over time in overall cigarette consumption and age participants first started smoking.

8.2.1 Gender differences

When male and female respondents were compared, the average age of females in the sample was 38.5 years (*SD* = 12) and the average age of males was 37 years (*SD* = 11). Thus very little difference is observed in age distribution between the sexes. Additionally, there was little difference observed between the groups when the age they first started smoking was compared; 15.8 years (*SD* = 4) for males and 15.6 years for females (*SD* = 3).

When gender was compared against education, marital and employment status, some differences were found between the sexes. On average, males had higher levels of education than females: *Standard grades*, M = 28%, F = 41%; *Highers*, M = 32%, F = 29%; and *Degrees*, M = 38%, F = 19%. In terms of marital status, slightly more women than men reported being married or living with a partner (F = 59%, M = 51%). Consequently, males reported being single more frequently than females (M = 49%, F = 41%). Examining the employment status of the sexes, more men (81%) than women (68%) reported being in full time employment.

Daily cigarette consumption was also compared between males and females. Again, only a small amount of variation was observed between the groups over time. At T1, males reported smoking an average of 18.2 (*SD* = 8.7) cigarettes each day and females smoked on average 16.8 (*SD* = 7.7) cigarettes each day. At T2, men smoked on average 17.5 (*SD* =10.5) cigarettes a day whilst woman

smoked 17.0 (*SD* = 9.4). At T3, males reported smoking an average of 18.1 (*SD* = 12.4) cigarettes per day, whilst females reported an average of 16.4 (*SD* = 14.9).

8.3 Statistical analysis

The following section will examine each main construct under investigation in turn. It will look at smoking behaviours, attitudes towards the smoking ban, stages and processes of change, decisional balance, and addiction responses. Initially distribution patterns will be provided for each measure before moving forward to assess normality distributions. More complex statistical analysis will then be carried out, examining comparisons of the variables over T1, T2 and T3 of the research design.

8.4 Smoking behaviours

8.4.1 Cigarette consumption

Self reported cigarette consumption was collected at T1, T2 and T3. This was assessed using two different methods: a single item self report continuous measure asking participants how many cigarettes they smoked per week; and a single item categorical response from the validated FTND questionnaire asking how many cigarettes were smoked per day.

Due to the large amount of missing data observed at T2 and T3 it was considered inappropriate to run an ANOVA or similar multivariate analysis to determine the differences in cigarette consumption over time. This type of analysis would not result in an accurate assessment of changes in the data, and may increase the chance of making a Type I error (Dancey & Reidy 2002). Therefore, in order to effectively handle the missing data, and assess actual change scores over time, participants were split into groups based on the times they returned their cigarette consumption responses. For example, individuals who provided data at all three time intervals were categorised as Group 1. Individuals who provided data at T1 and T2 only were classified as Group 2. Individuals providing data at T1 and T3 only were Group 3. Formal analysis concerning cigarette consumption was then carried out on these three groups. This method of splitting participants into groups based on the time intervals that data was returned will be retained for the duration of the results section and will be kept standardised throughout the report.

Weekly cigarette consumption (continuous)

Group 1

These individuals provided data at all three time intervals, T1, T2, and T3 (*n* = 45, 35.4% of the sample). At T1, the mean amount of cigarettes smoked per week was reported as 126.8 (*SD* = 69.4), median = 115. The 95% confidence interval for estimated population mean difference at T1 was between 105.9 and 147.6. At T2, the average weekly cigarette consumption was 125.2 (*SD* = 72.8), median = 115, 95% *CI*, 103.3 - 147.0. At T3 the mean amount of cigarettes smoked per week was 120.5 (*SD* = 76.5), median = 90, 95% *CI*, 97.5 - 143.5. Normality was assessed via the use of descriptive statistics and normality plots. Kolmogorov-Smirnov statistic results indicated that data at all three time intervals violated the

assumption of normality, T1 (.029), T2 (.031), and T3 (.003). A non significant result on the Kolmogorov-Smirnov statistic (p = >.05) indicates normality (Pallant 2001). Therefore, formal analysis of the data was conducted with a non parametric test, the Friedman test, to assess for differences in the amount of cigarettes smoked over time. Whilst the mean ranks provided by the Friedman results showed a steady decrease over time (T1 = 2.23, T2 = 1.93, T3 = 1.83), this analysis failed to find significant differences between the groups X^2 (2, N = 45) = 4.841, p = .089).

Group 2

Individuals who provided data at T1 and T2 were classified into Group 2 (n = 79, 62% of the sample). At T1, the mean total amount of cigarettes smoked per week was reported as 121.5 (SD = 61.3), median = 115, with a 95% confidence interval for estimated population mean difference between 107.7 and 135.2. At T2, the average cigarette consumption per week was 120.3 (SD = 68.5), median = 115, 95% CI, 105.0 - 135.7. Although four outliers were observed at T2, these were deemed to have little effect on the mean, as the trimmed mean was 117.6 for weekly cigarette consumption (WCC). Therefore these cases were retained in the analysis. Kolmogorov-Smirnov statistics results indicated that WCC data at both T1 (.044), and T2 (.001), violated normality assumptions. Therefore, formal analysis of the data was conducted using a non-parametric test, the Wilcoxon Signed-Rank test, to compare differences between the two groups. This analysis found no significant differences in WCC between the groups at T1 and T2 (z = 0.760, N - ties = 64, p = .112, one-tailed).

Group 3

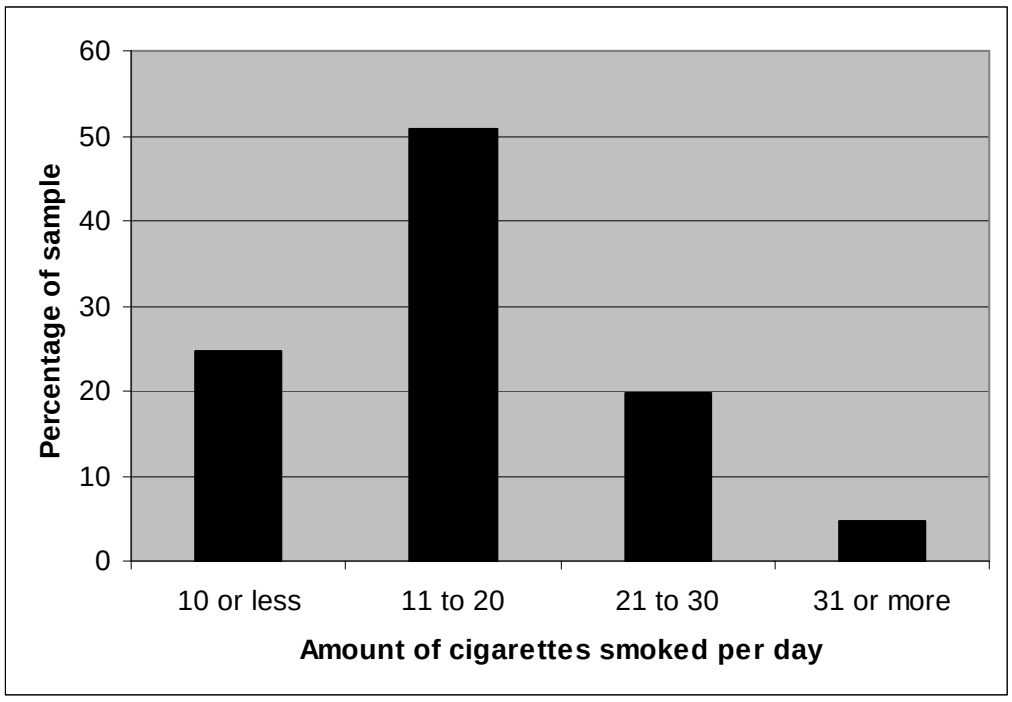
Individuals providing data at T1 and T3 only were classified into Group 3 (n = 49, 39% of the sample. At T1, the mean total amount of cigarettes smoked per week was reported as 125.7 (SD = 66.6), median = 111, with a 95% confidence interval for estimated population mean difference between 106.6 and 144.9. At T3, the average cigarette consumption per week was 119.9 (SD = 74.1), median = 104, 95% CI, 98.6 - 141.2. The data was tested for normality and output from the Kolmogorov-Smirnov analysis indicated that whilst T1 was normally distributed (.168), T3 (.010) violated normality assumptions. Therefore a non-parametric test,

the Wilcoxon Signed-Rank test, was utilised to compare differences between the two groups. This inferential analysis found no significant differences between the groups in weekly cigarette consumption when T1 and T3 were compared (z = 1.510, N - ties = 39, p = .065, one-tailed).

Daily cigarette consumption (categorical)

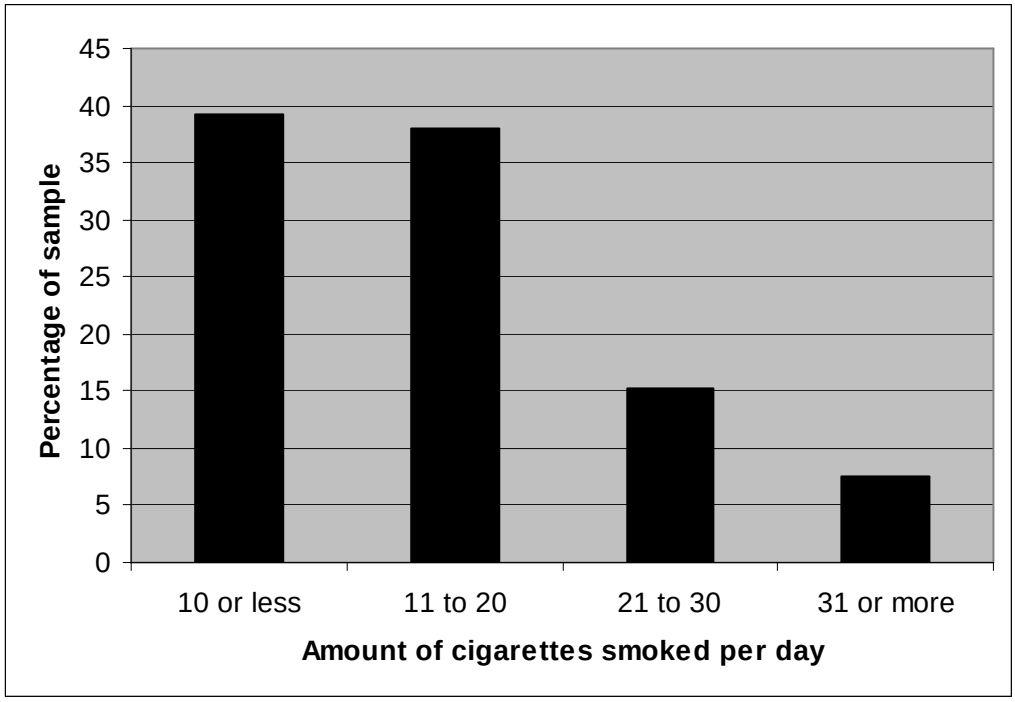
In order to further validate the above findings, daily cigarette consumption (DCC) was collected from question four of the Fagerstrom Test for Nicotine Dependence (FTND): *How many cigarettes a day do you smoke?* This item prompts a categorical response and individuals choose one of four categories. Descriptive data for this question is presented in Figures 4-6, showing DCC at each time interval of data collection.

Figure 4: Daily cigarette consumption at T1



As Figure 4 shows (n= 126), the majority of the sample (51%) smoked between 11-20 cigarettes per day at T1. The bar graph demonstrates that, on the whole, the sample were relatively light smokers, with 75% of the sample smoking 20 or fewer cigarettes per day. 1% of respondents failed to provide data for this question.

Figure 5: Daily cigarette consumption at T2



As Figure 5 shows (n=79), the majority of the sample (77%), smoked 20 or fewer cigarettes per day at T2. Only 8% of the sample reported smoking 31 or more cigarettes per day. 38% of participants failed to provide data at this time interval.

Figure 6: Daily cigarette consumption at T3

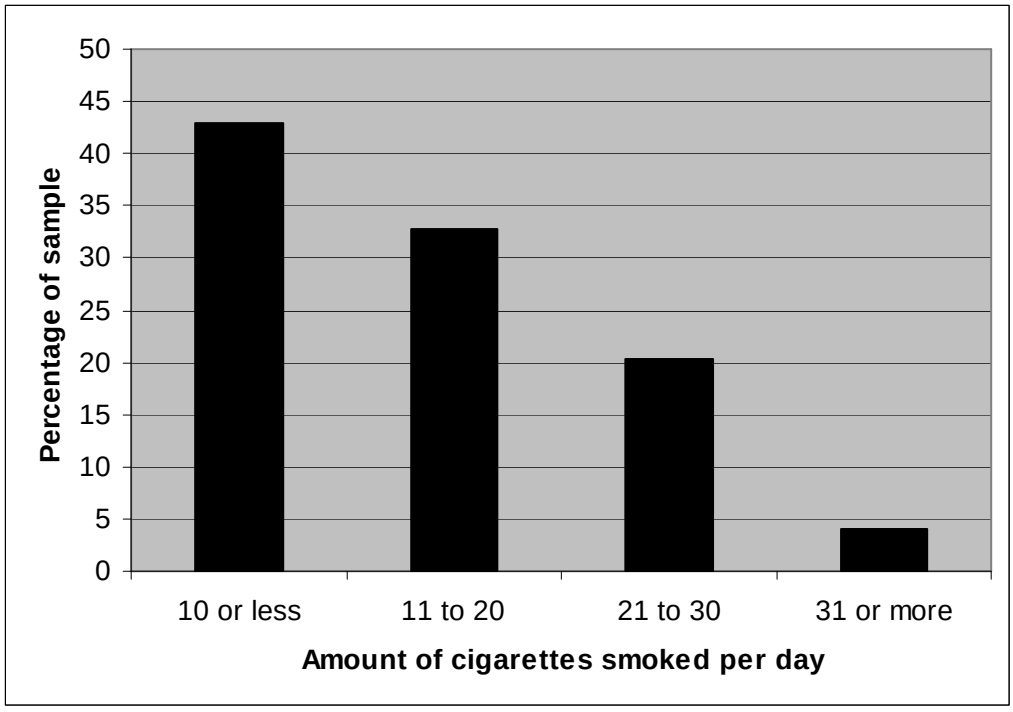


Figure 6 above (n= 49), shows that the majority of the sample, 43%, reported smoking 10 or less cigarettes per day at T3. 33% of the sample smoked between

11 - 20 cigarettes per day. Only 4% of the sample smoked 31 or more cigarettes per day. 61% of the data was missing for this item at T3.

Again, due to the large amount of missing data at T2 and T3 of data collection the participants were split into groups based on their data return responses. Inferential analysis was carried out on each group in turn, in order to effectively handle the missing data and assess actual change scores over time.

Daily cigarette consumption

Group 1

These individuals provided data at all three time intervals, T1, T2, and T3 (*n* = 44, 34.6% of the sample). Normality was assessed via the use of descriptive statistics and normality plots. Kolmogorov-Smirnov statistics results indicated that data at all time intervals, T1, T2 and T3, was not normally distributed (.000). In addition, due to the floor and ceiling effects resulting from the classification of participants into four categories (amount of cigarettes smoked), it was determined that a non-parametric statistical analysis was most appropriate for this analysis. The reasoning for this concerned the categorical classification resulting in ordinal categories and the relatively small sample size (Pallant 2001). Additionally, the Friedman test analyses the data in rank order rather than analysis of the mean as seen in ANOVA, and is consequently the most appropriate analysis for non-normally distributed data (Brace, Kemp & Snelgar 2006). Therefore, formal analysis of the data was conducted with the Friedman test. The mean ranks provided by the Friedman results indicated a steady decrease over time (T1 = 2.17, T2 = 1.97, T3 = 1.86), and this result reached significance X^2 (2, N = 44) = 6.632, *p* = .036). Therefore, a significant difference was found in the amount of cigarettes smoked over time, with daily cigarette consumption declining over time.

Group 2

Individuals who provided data at T1 and T2 were classified into Group 2 (*n* = 78, 61.4% of the sample). As the data was not normally distributed, inferential analysis was conducted using a non-parametric test, the Wilcoxon Signed-Rank test, to compare differences between these two groups. The results from this analysis demonstrated significant differences between the groups in DCC at T1

and T2 (z = 2.502, N - ties = 24, p = .006, one tailed), with individuals smoking fewer cigarettes at T2.

Group 3

Individuals who provided data at T1 and T3 were classified into Group 2 (n = 48, 37.8% of the sample). Again as the data was not normally distributed, inferential formal analysis of the data was conducted using a non-parametric test, the Wilcoxon Signed-Rank test, to compare differences between these two groups. The results from this test indicated that significant differences were observable between the groups in DCC at T1 and T3 (z = 2.236, N - ties = 17, p = .0125, one tailed), with individuals smoking fewer cigarettes per day at T3.

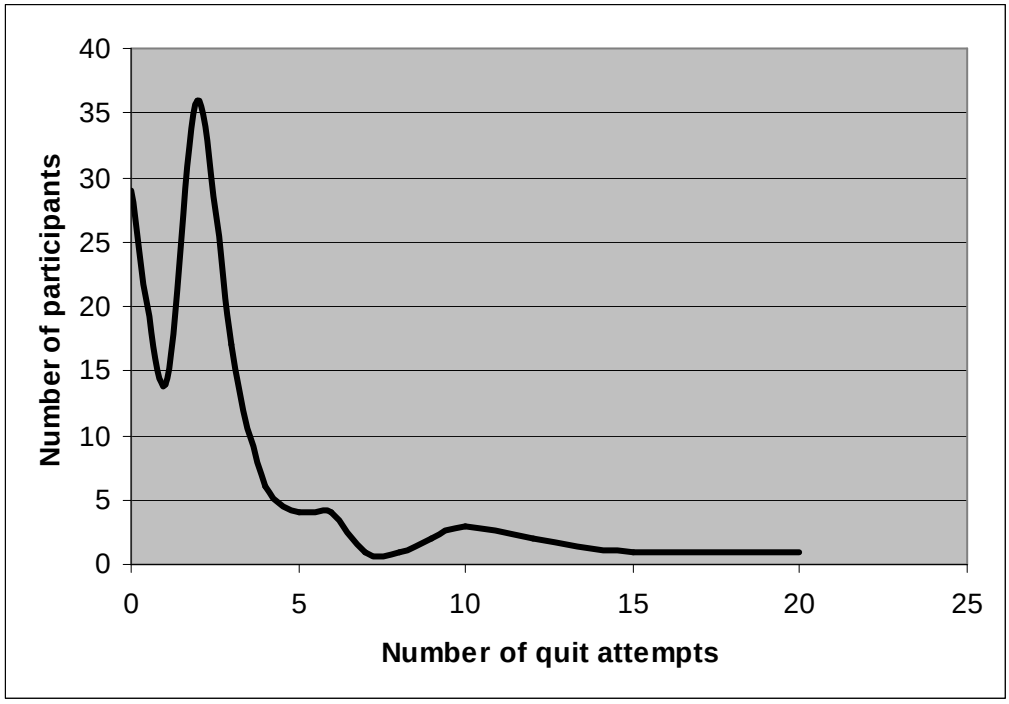
8.4.2 Intention to cut down cigarette consumption

When intentions were examined at baseline, 60% of the sample reported that they were planning on cutting down on their cigarette consumption as a direct result of the smoking ban. At T2, 44% of the sample reported that they had reduced their cigarette consumption as a result of the smoking ban. At T3 this figure was 49%.

8.4.3 Quit attempts

On average, smokers in the current sample had made an average of 2.7 (SD = 3.2) quit attempts over their lifetimes at T1. Figure 7 below shows the number of reported lifetime quit attempts at T1.

Figure 7: Self-reported frequency of lifetime quit attempts at T1



As Figure 7 demonstrates (n=121), 24% (n=29) of the sample had never attempted to quit smoking at T1. The majority of the sample, 55% (n=67), reported between 1 and 3 serious quit attempts over their lifetimes. The remainder of the sample, 21% (n=25), reported making between 4 to 20 lifetime quit attempts.

Considering the 12 months prior to data collection at T1 (baseline), 43% of the sample reported having had at least one quit attempt lasting more than 24 hours. In addition, 32% of the sample reported nil quit attempts in these 12 months. A high percentage of individuals failed to respond to this question (25%).

Smokers who reported previous quit attempts at T1 were asked how long was the lengthiest single period of time they had stayed away from cigarettes for. Length of previous quit attempts made by the sample ranged from 1 day to 4.7 years with a mean successful quit attempt of 4.5 weeks (*SD* = 9).

A comparison of quit attempts was analysed for each of the three time intervals and is presented in Figure 8 below.

Figure 8: Reported quit attempts over time

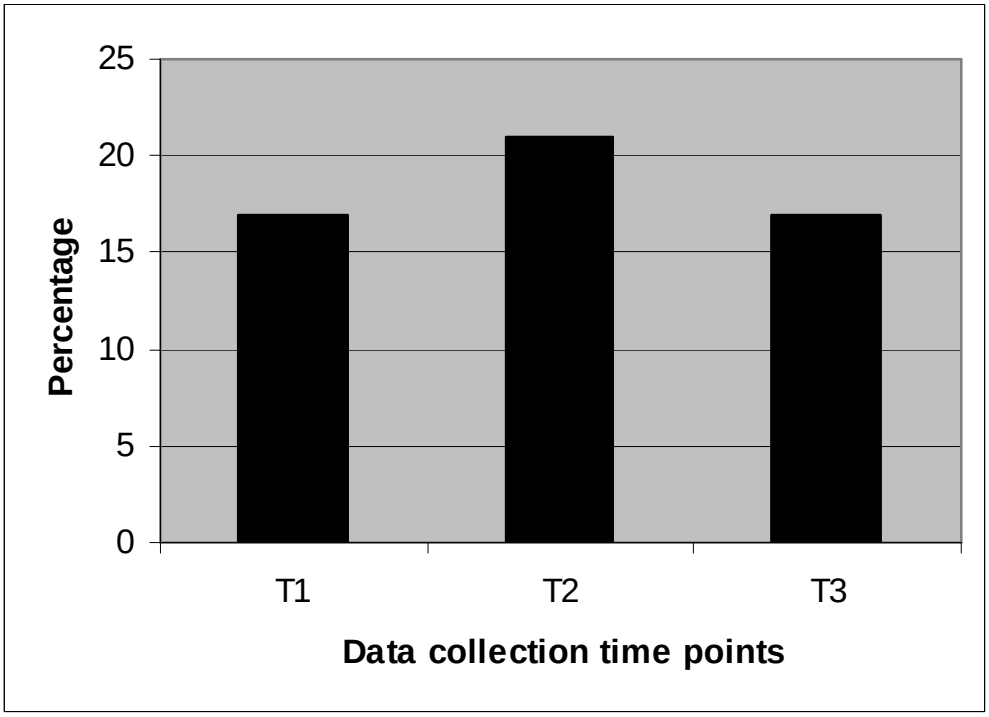


Figure 8 shows the samples' self-reported quit attempts three months prior to the ban (T1), three months after the ban (T2) and three months after T2 (T3). Whilst little difference is observed in quit attempts over time (T1 = 17% (n=14), T2 = 21% (n=17) and T3 = 17% (n=14)), a slight increase in quit attempts can be observed at T2.

Out of 88 individuals who returned information concerning their smoking status at T2, 10.2% (n = 9) of the sample reported that they had quit smoking. At T3, 55 individuals provided this information and 10.9% (n = 6) reported that they had successfully quit smoking.

8.4.4 Summary

In terms of data collected from the continuous self reported rates of cigarette consumption, inferential statistical analysis indicated no significant differences in cigarette consumption when pre and post ban rates were compared. Conversely, when cigarette consumption was examined with the results from the validated FTND questionnaire, on a categorical classification, significant differences were found, with a decrease in cigarette consumption reported over time. Almost two-thirds of the sample intended to cut down on smoking at baseline, and nearly half of participants reported cutting down on cigarette consumption at T2 and T3. Quit

ratios indicated very little change in pre and post ban quit attempts, however approximately 10% of the sample indicated that they had quit smoking after the ban implementation (T2 and T3).

8.5 Attitudes towards the smoking ban

At each time interval, participants were asked: *If they could determine the smoking policy in Scotland, what would be the level of intervention they'd choose?* Participant responses for T1, T2 and T3 are detailed in Figure 9 below.

Figure 9: A line graph showing attitudes towards the smoking ban over time

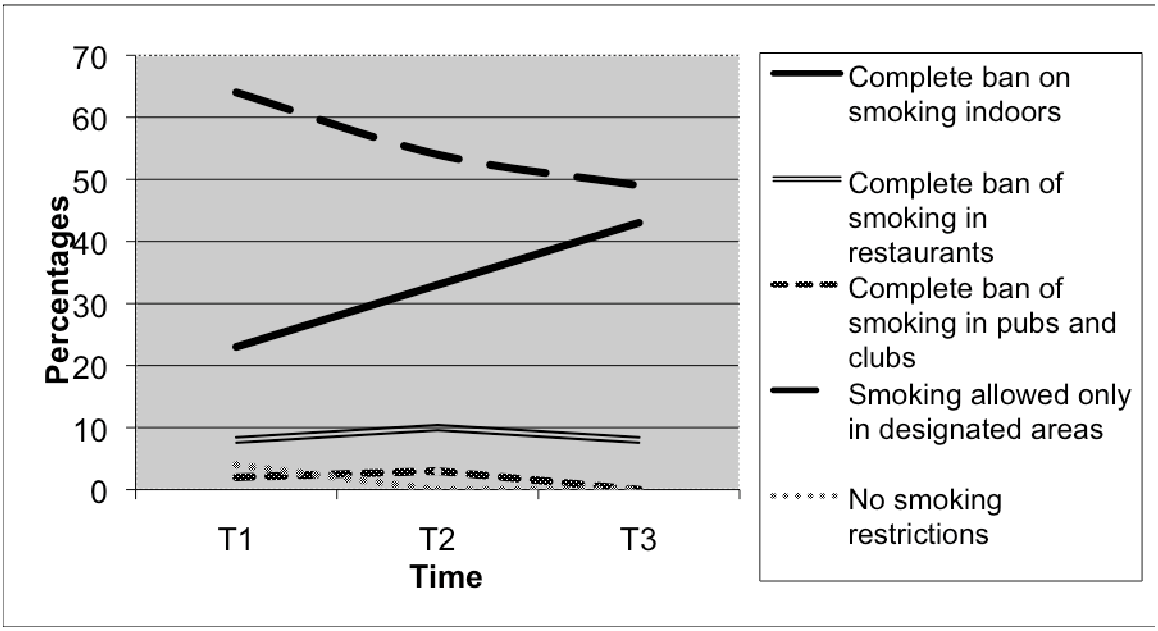


Figure 9 shows little change in attitudes towards the ban in the terms of advocating that there should be no smoking restrictions, a complete ban of smoking in restaurants, or a complete ban of smoking in pubs and clubs. However, the line graph clearly demonstrates that individuals were more in favour of a complete ban on indoor smoking as time progressed, with a favourable increase of 20% when T1 was compared with T3. Comparatively, support for smoking being allowed only within designated areas, declined over time, with a 15% drop from T1 to T3.

8.6 Stages of change

Stages of change classification were calculated for each participant at every time point of data collection. Table 5 below shows the number of participants in each stage of change category at intervals T1, T2, and T3

Table 5: Stages of change categorisation over time.

	Time Intervals		
Variable	**T1**	**T2**	**T3**
Sample size (n)	127	89	55
Stage of change (n)			
Precontemplation (PC)	51 (40%)	39 (44%)	23 (42%)
Contemplation (C)	51 (40%)	34 (38%)	20 (36%)
Preparation (PA)	25 (20%)	7 (8%)	6 (11%)
Action (A)	N/A	9 (10%)	6 (11%)

Whist Table 5 shows some fluctuation in stage of change categorisation over time, due to the large amount of missing data, stages of change movement cannot be adequately assessed until further analysis is carried out. This will be conducted in the latter section of this chapter. Comparisons were initially carried out to examine if stage distribution was affected by demographic predictor variables.

A series of binary logistic regressions was conducted with the relevant stage of change as the dependent variable and age, education, gender, employment and martial status as predictor (or independent) variables. A total of 120 cases were analysed at each logistic regression and eleven separate analyses were conducted. Each stage of change was examined separately at every time interval in order to control for the low sample sizes and to increase the power of observations. Findings indicated that at all time intervals, T1, T2 and T3, none of the predictor variables were able to significantly predict stage membership. Therefore there were no significant differences amongst precontemplators (PC), contemplators (C), preparators (P) and action (A) participants on age, gender, employment, education or marital status distributions, as demonstrated with logistic regression analyses.

Two of the hypothesis under consideration in this paper concern stages of change progression. Hypotheses were formed and proposed that smokers in the preparation stage of the model would show further stage progression than those in the precontemplation or contemplation stages of the model. Secondly, the smoking ban intervention was hypothesised to influence individuals' progress towards quitting smoking and increase progression along the stages of change continuum.

In order to examine stage progression, the baseline stage of change was subtracted from the follow up stages as advocated by Armitage et. al (2004). Progression was observed if individual's moved to a later stage in the model. Individuals who did not move stages were identified as static. Individuals who regressed moved to an earlier stage of the model. Table 6 below shows the frequencies and percentages of individuals' stages of change movement from T1 to T2.

Table 6: Number of participants regressing, remaining static or progressing from each stage of change: T1 to T2

	Regress		Static		Progress		Total	
Stage	N	%	N	%	N	%	N	%
Precontemplation			28	*31.5*	5	*5.6*	33	*37.1*
Contemplation	9	*10.1*	18	*20.2*	8	*9.0*	35	*39.3*
Preparation	14	*15.7*	4	*4.5*	3	*3.4*	21	*23.6*
Total	23	*25.8*	50	*56.2*	16	*18.0*	89	*100*

As seen in Table 6 above, the majority of the sample, 56.2%, stayed in the same stage, 25.8% of the sample "regressed" and 18% "progressed" when stages at T1 and T2 were compared. Of the individuals who regressed, 21 (23.6%) regressed one stage and two (2.2%) regressed two stages. In terms of the individuals who progressed, nine (10.1%) progressed one stage and seven (7.9%) progressed two stages. Contemplators were more likely to progress when compared to individuals in the precontemplation and preparation stages. Conversely, individuals in the preparation stage were most likely to regress.

The concept of stage progression was also assessed between time points T2 and T3. Table 7 below shows the frequencies and percentages of individuals' stages of change movement over these time periods.

Table 7: Number of participants regressing, remaining static or progressing from each stage of change: T2 to T3

	Regress		Static		Progress		Total	
Stage	N	%	N	%	N	%	N	%
Precontemplation			16	*30.8*	3	*5.8*	19	*36.6*
Contemplation	4	*7.7*	17	32.7	2	*3.8*	23	*44.2*
Preparation	1	*1.9*	4	7.7			5	*9.6*
Action			5	*9.6*			5	*9.6*
Total	5	*9.6*	42	*80.8*	5	*9.6*	52	*100*

As seen in Table 7 above, the majority of the sample, 80.8%, stayed in the same stage, 9.6% of the sample "regressed" and 9.6% "progressed" when stages T2 and T3 were compared. Of the individuals who regressed, four (7.7%) regressed one stage and one (1.9%) regressed two stages. The same pattern was observed in individuals who progressed: four (7.7%) progressed one stage and one (1.9%) progressed two stages. Precontemplators were the most likely to progress and those in the contemplation stage were most likely to regress

The concept of stage progression was also assessed between time points T1 and T3. Table 8 below shows the frequencies and percentages of individuals' stages of change movement over these time periods.

Table 8: Number of participants regressing, remaining static or progressing from each stage of change: T1 to T3

	Regress		Static		Progress		Total	
Stage	N	%	N	%	N	%	N	%
Precontemplation			18	*32.7*	3	*5.5*	21	*38.2*
Contemplation	3	*5.5*	12	21.8	6	*10.9*	21	*38.2*
Preparation	7	*12.7*	5	9.1	1	*1.8*	13	*23.6*
Total	10	*18.2*	35	*63.6*	10	*18.2*	52	*100*

As seen in Table 8 above, the majority of the sample, 63.6%, stayed in the same stage, 18.2% of the sample "regressed" and 18.2% "progressed" when stages at T1 and T3 were compared. Of the individuals who regressed, 8 (14.5%) regressed one stage and 2 (3.8%) regressed two stages. In individuals who progressed, 5 (9.1%) progressed one stage and 5 (9.1%) progressed two stages. Contemplators were the most likely to progress and those in the preparation stage were most likely to regress.

8.6.1 Summary

Logistic regression analysis demonstrated that stage membership was unrelated to age, gender, education levels, employment or marital status. The greatest amount of stage movement was observed at T1 (Baseline) to T2 (3 months after ban implementation). Only 56% of individuals remained static, whilst 26% regressed and 18% progressed. When T1 to T3 was compared, a similar pattern was observed, however more individuals remained static (64%) and less individuals regressed (18%). Progression rates stayed the same at 18%. Finally, when T2 to T3 were compared the least amount of movement was seen, with 81% of the sample remaining static. 10% of the sample regressed and 10% progressed between these time intervals. Therefore stage variation was greatest when baseline (T1) was compared with post ban intervals (T2 and T3). In addition, contemplators were the most likely to progress over time, followed by precontemplators. Preparators demonstrated the least amount of stage progression.

8.7 Processes/ strategies of change

Self change strategies for current smokers (SCS-CS) Questionnaire

Participants were questioned on the types of self change strategies they employed in relation to their smoking behaviours. These responses were used to examine the processes of change construct of the transtheoretical model of change (TTM). The differences in the self change strategies were examined over time. Table 9 below shows the means, standard deviations and confidence intervals, demonstrating the use of self change strategies over time.

Table 9: Self-change strategies utilised by the sample over time

	Time Intervals		
	T1 (n =123)	**T2** (n = 78)	**T3** (n = 55)
Variable	M SD	M SD	M SD
Commitment to change	13.1 4.5	12.7 4.4	13.2 4.4
Confidence Interval (CI)	*12.3 - 13.9*	*11.7 – 13.7*	*11.9 – 14.5*
Taking control	9.2 3.6	10.5 3.8	10.1 3.7
Confidence Interval (CI)	*8.5 - 9.8*	*9.6 – 11.4*	*9.1 – 11.2*
Risk assessment	11.3 4.3	11.2 4.2	11.1 3.9
Confidence Interval (CI)	*10.4 – 11.9*	*10.3 – 12.2*	*10.0 – 12.2*
Helping relationships	5.2 2.7	5.0 2.6	5.2 2.5
Confidence Interval (CI)	*4.8 – 5.7*	*4.4 – 5.5*	*4.5 – 5.9*
Coping with the temptation to smoke	5.4 2.2	5.6 2.5	5.3 2.2
Confidence Interval (CI)	*5.0 – 5.8*	*5.0 – 6.1*	*4.7 – 6.0*

As Table 9 above shows, there is very little variation in the use of self change strategies when responses for the complete sample are compared over time. The average scores for each of the self change strategies are observed below in graphical form (Figure 10).

Figure 10: A line graph showing the use of self-change strategies over time

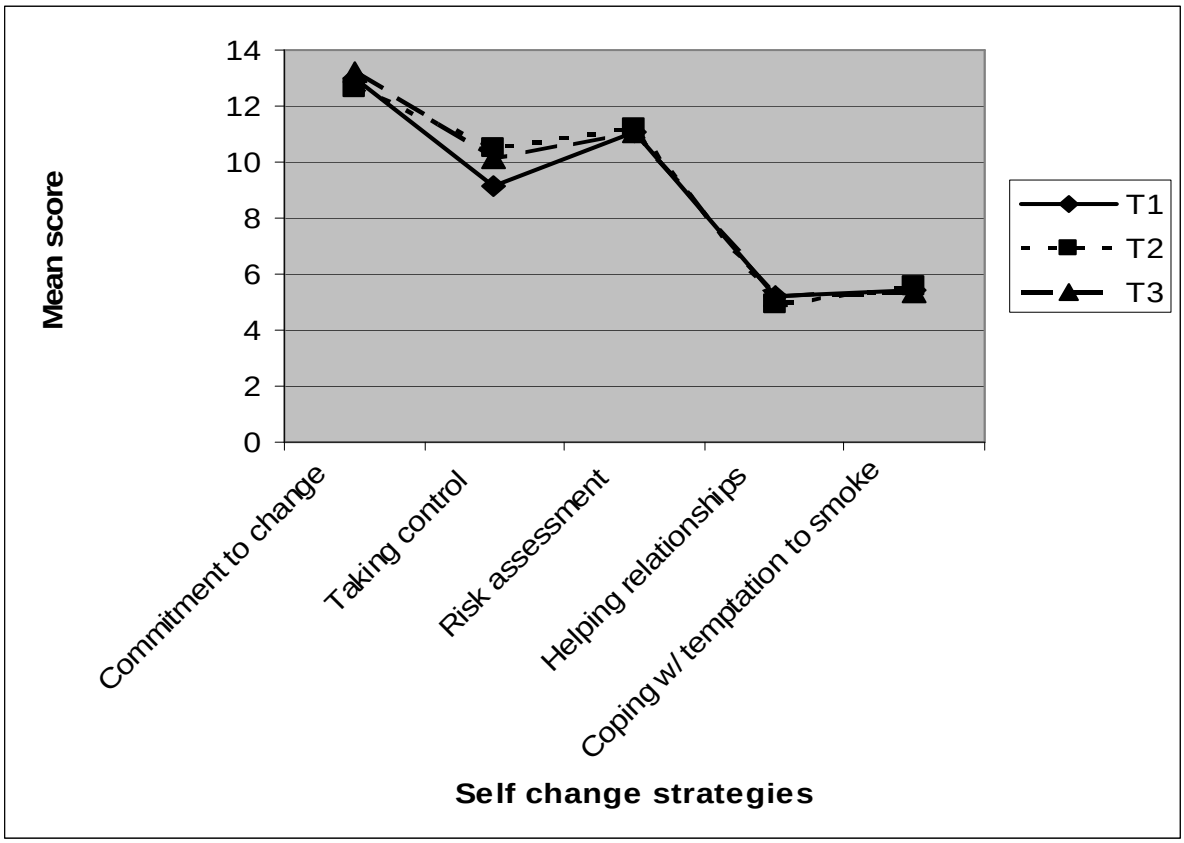


Figure 10 shows that across all time intervals, participants used the cognitive strategy of commitment to change most frequently. The use of risk assessments was the second most frequently used strategy. Taking control was the third most used strategy within the sample. Coping with the temptation to smoke and helping relationships were the least frequently used strategies within this sample. Normality analysis in the form of normality plots and the Kolmogorov-Smirnov statistic indicated that none of the self change strategies were normally distributed over all time intervals. Kolmogorov-Smirnov statistics failed to reach significance at the p= 0.05 level, for all strategies over time. The data for all of the self change strategies was positively skewed, therefore square root transformations were conducted on the data in order to assume normality. However, this transformation did not result in improving the normality of the date and therefore the original raw

data was retained for analysis. Non parametric statistical techniques were used to formally analyse the use of self change strategies in the current sample.

8.7.1 Self-change strategies

Group 1

These individuals provided data at all three time intervals, T1, T2, and T3 (*n* = 45, 35.4% of the sample). The Friedman test was used to formally assess the differences in each of the self change strategies over time. Initially examining the *commitment to change* strategy, the mean ranks provided by the Friedman results indicated some variation over time (T1 = 2.22, T2 = 1.80, T3 = 1.98). However, this result failed to reach significance levels X^2 (2, N = 45) = 5.02, *p* = .081). When differences in the *taking control* strategy were observed, Friedman mean ranks demonstrated some change over time: T1 (1.70), T2 (2.18) and T3 (2.12). These differences did reach significance X^2 (2, N = 45) = 7.23, *p* = .027). The mean ranks seem to show that the largest difference in the use of the taking control strategy are between T1 and T2/T3. Therefore these scores indicate an increase in the use of the *taking control* strategy after the smoking legislation had been implemented. The remaining self change strategies were also analysed using the Friedman test, however none of these strategies showed significant differences in their use over time: *risk assessment*, Friedman mean ranks, T1 (2.06), T2 (2.06) and T3 (1.89) and X^2 (2, N = 45) = 1.05, *p* = .592); *helping relationships*, Friedman mean ranks, T1 (1.99), T2 (1.93) and T3 (2.08) and X^2 (2, N = 45) = .827, *p* = .661); and finally *coping with the temptation to smoke*, Friedman mean ranks, T1 (2.03), T2 (2.03) and T3 (1.93) and X^2 (2, N = 45) = .529, *p* = .767).

Group 2

Individuals who provided data at T1 and T2 were classified into Group 2 (*n* = 78, 61.4% of the sample). Analysis of the data was conducted using the Wilcoxon Signed-Rank test, to compare differences in reported use of the self change strategies between the groups. The same pattern of findings as seen in Group 1 (above) was observed. Whilst there was a significant difference between the groups in the *taking control* strategy, with scores increasing at T2 (*z* = -4.049, *N* - ties = 66, *p* = .001, two tailed), no other significant differences were observed between the groups in the remainder of the self change strategies: *commitment to change*, *z* = -1.180, *N* - ties = 60, *p* = .238, two tailed; *risk assessment*, *z* = -.374,

N - ties = 60, *p* = .708, two tailed; *helping relationships*, *z* = -.072, *N* - ties = 46, *p* = .942, two tailed; and *coping with the temptation* to smoke , *z* = -.768, *N* - ties = 46, *p* = .442, two tailed.

Group 3

Individuals who provided data at T1 and T3 were classified into Group 3 (*n* = 49, 38.6% of the sample). Analysis of the data was conducted using the Wilcoxon Signed-Rank test, to compare for differences in reported use of self change strategies between these two groups. The same pattern of findings as seen in Group 1 and Group 2 (above) was demonstrated. Whilst there was a significant difference between the groups in the *taking control* strategy, with scores increasing at T3 (*z* = -2.620, *N* - ties = 637, *p* = .009, two tailed), no other significant differences was observed between the groups in the remainder of the self change strategies: *commitment to change*, *z* = -.267, *N* - ties = 34, *p* = .789, two tailed; *risk assessment*, *z* = -.791, *N* - ties = 37, *p* = .429, two tailed; *helping relationships*, *z* = -.723, *N* - ties = 24, *p* = .470, two tailed; and *coping with the temptation to smoke* , *z* = -.668, *N* - ties = 37, *p* = .009, two tailed.

8.7.2 SCS and confounding factors

As the data collected from the SCS-CS questionnaire was not able to be analysed with parametric statistical techniques, one was unable to control for the possible influences of confounding factors including age, gender and education level. Consequently, the descriptive mean and median scores and standard deviations for each of the SCS-CS were visually examined for each of the self change strategies, to assess whether there were any observable differences.

Gender

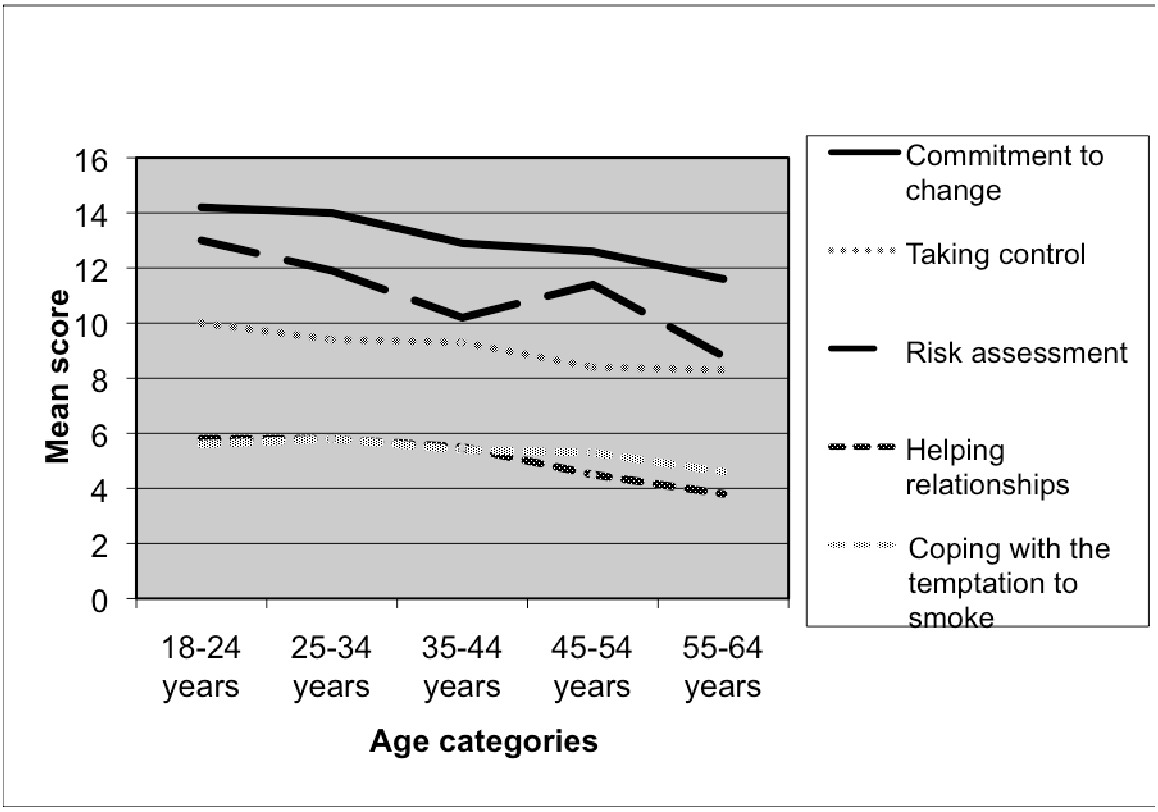
When gender was examined, the means, medians and SDs showed very small fluctuations between males and females. However, a few of the self-change strategies displayed over one point in difference between the genders when mean and medians were examined. These were formally analysed with Mann-Whitney tests to examine if there were any significant differences in use of self change strategies between the genders. At T1, the *commitment to change* strategy mean and medians showed over one point difference between the sexes. However,

there was no significant difference between men and woman in their use of this strategy (U = 1549.500, N^1 = 47, N^2 = 78, p = .147, two-tailed). At T3, three of the self change strategies showed greater than one point difference between the sexes and therefore, Mann-Whitney tests were employed to test if these differences were significant. Both *commitment to change* (U = 233.500, N^1 = 21, N^2 = 28, p = .219, two-tailed) and *risk assessment* (U = 220.500, N^1 = 21, N^2 = 28, p = .134, two-tailed) strategies showed no significant differences in use when men and women were compared. However, one significant difference was found between the sexes, and at T3 women were found to use the *coping with the temptation* to smoke strategy more frequently than men (U = 172.000, N^1 = 21, N^2 = 28, p = .011, two-tailed).

Age

The mean scores for each of the self change strategies (SCS) in relation to the participant age groups are given below in Figure 11.

Figure 11: The use of SCS by age group at T1



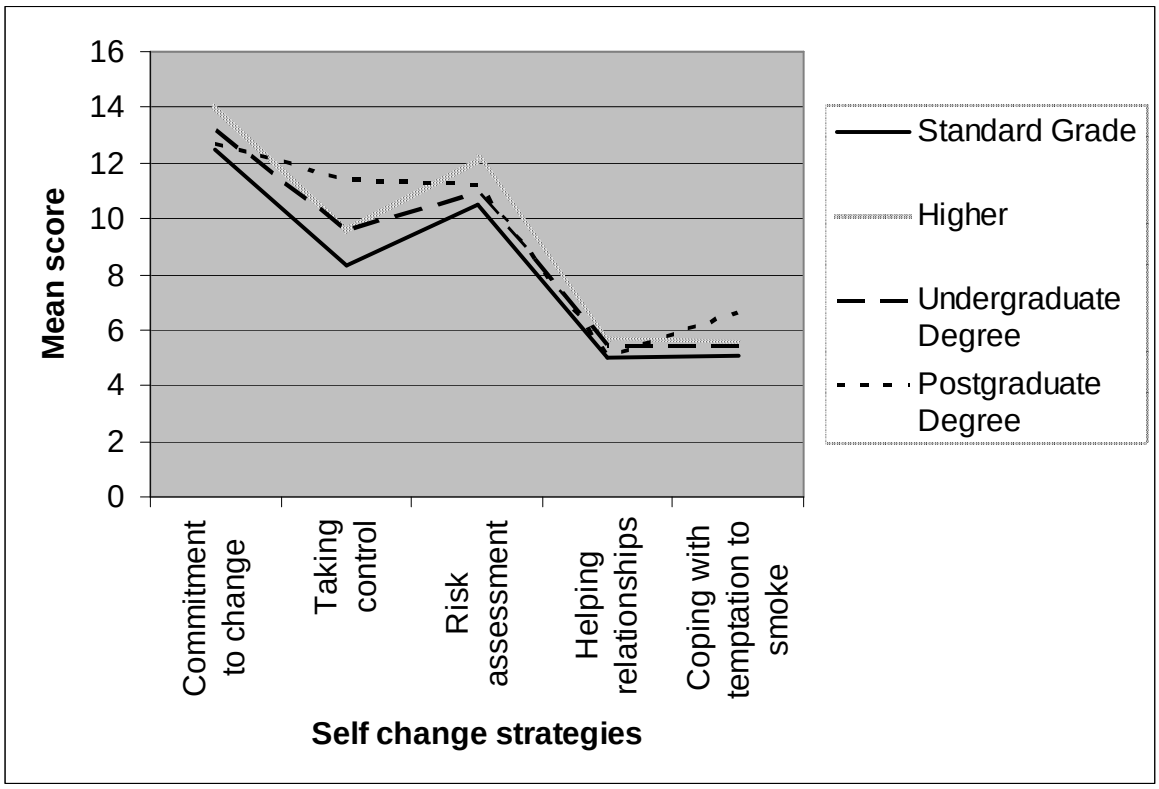
As Figure 11 shows, in general individuals between 18 and 24 years of age use the self change strategies more frequently than those in other age groups.

However, similar patterns of use can be observed in all age categories with all groups using the *commitment to change* strategy most frequently and most groups using the *coping with the temptation to smoke* category least frequently. The strategy of *risk assessment* varies the most, with two distinct peaks observed in use at 18-24 and 45-54 years. However, in general, there seems to be little variation when SCS are compared against age groups.

SCS and Education Levels

Figure 12 below shows the use of self change strategies (SCS) by levels of participant education at T1.

Figure 12: The use of SCS across education levels at T1



As observed in Figure 12 above, in general, participants with postgraduate degrees and Highers make more frequent use of all SCS and those with a standard grade level of education make least frequent use of the SCS. Taking control appears to have the most variation amongst the education levels and a noticeable difference can be seen between those with postgraduate degrees (Median 10) and those with standard grades (Median 8). This was formally analysed with the use of a Mann-Whitney test and this difference was found to be

significant (U = 205.500, N^1 = 49, N^2 = 14, p = .021, two-tailed). However, as a whole, little variation is observed between the education groups and the remaining self change strategies.

8.7.3 Self change strategies and the stages of change

The TTM postulates that different processes of change will be observed at distinct stages. According to the TTM predictions, higher use of cognitive strategies will be reported in the earlier stages of the model, and strategies incorporating behavioural elements will be reported more frequently in the later model stages. Within the self-change strategies for current smokers questionnaire (SCS-CS), *commitment to change* and *risk assessment* are classified as cognitive strategies and *taking control* and *helping relationships* are classified as behavioural strategies. *Coping with the temptation to smoke* consists of both cognitive and behavioural elements.

Initial examination of the SCS-CS questionnaire in relation to stages of change indicated that assumptions for normality were not met for all strategies. Normality was assessed via the use of normality plots and the use of Kolmogorov-Smirnoff (KS) statistics: these were conducted for each strategy over time and are shown in Table 10.

Table 10: SCS-CS and the stages of change: Kolmogorov-Smirnoff (KS) scores over time

	T1			T2			T3		
	PC	*C*	*P*	*PC*	*C*	*P*	*PC*	*C*	*P*
- Commitment to change	.001	.086*	.089*	.001	.008	.130*	.002	.200*	.094*
- Taking control	.001	.001	.200*	.140*	.200*	.200*	.001	.003	.002
- Risk assessment	.001	.024	.054*	.001	.200*	.200*	.019	.094*	.200*
- Helping relationships	.001	.001	.001	.001	.004	.200*	.001	.001	.200*
- Coping with the temptation to smoke	.001	.075*	.001	.007	.008	.200*	.006	.002	.200*

* = normally distributed

As observed in Table 10, normality could not be assumed for the majority of self-change strategies (SCS). Consequently, non parametric formal analysis was utilised to examine the differences between the stages of change categories and the self-change strategies. The non-parametric Kruskal-Wallis test was mainly used as an equivalent to the one-way between subjects ANOVA.

Commitment to change and the stages of change

At T1, results from the Kruskal-Wallis test show significant differences between the stages of change and the use of the *commitment to change* strategy X^2 (2, N = 125) = 38.563, p = .001). Mean ranks for each of the three stages of change were 39.7 for precontemplation (PC), 74.1 for contemplation (C) and 88.8 for preparation (P). As the Kruskal-Wallis does not allow a facility for post-hoc comparisons, Mann-Whitney tests were carried out to determine where the significance difference lay. Results from this indicate that each stage of change was significantly different from each other in use of the *commitment to change* strategy: PC and C (U = 504.500, N^1 = 51, N^2 = 49, p = .001, two-tailed); PC and P (U = 195.000, N^1 = 51, N^2 = 25, p = .001, two-tailed); and C and P (U = 411.000, N^1 = 49, N^2 = 25, p = .020, two-tailed). Both median and mean scores indicated

that participant use of this strategy increased as individuals progressed through the stages.

At T2, results from the Kruskal-Wallis test show significant differences between the stages of change and the use of the *commitment to change* strategy X^2 (2, N = 78) = 25.021, p = .001). Mean ranks for each of the three stages of change were 26.5 for precontemplation (PC), 49.4 for contemplation (C) and 60.6 for preparation (P). Mann-Whitney tests were carried out to determine where the significant difference lay. Results from found two significant differences from in the use of the *commitment to change* strategy: PC and C (U = 243.000, N^1 = 37, N^2 = 34, p = .001, two-tailed); PC and P (U = 32.500, N^1 = 37, N^2 = 7, p = .002, two-tailed). The remaining stage comparison was not significant: C and P (U = 69.000, N^1 = 34, N^2 = 7, p = .080, two-tailed). Therefore, those in the PC stage made significantly less frequent use of the *commitment to change* strategy when compared to those in the C and P stages.

At T3, results from the Kruskal-Wallis test again showed significant differences between the stages of change and the use of the *commitment to change* strategy X^2 (2, N = 49) = 22.055, p = .001). Mean ranks for each of the three stages of change were 15.5 for precontemplation (PC), 31 for contemplation (C) and 41.6 for preparation (P). Mann-Whitney tests were carried out to determine where the significant difference lay. Results from this indicated that there were significant differences between each stage of change and the use of the *commitment to change* strategy: PC and C groups (U = 71.000, N^1 = 23, N^2 = 20, p = .001, two-tailed); PC and P (U = 9.000, N^1 = 23, N^2 = 6, p = .001, two-tailed); and C and P stages (U = 20.500, N^1 = 20, N^2 = 6, p = .013, two-tailed). Both median and mean scores indicated that participant use of this strategy increased as individuals progressed through the stages.

Taking control and the stages of change

At T1, results from the Kruskal-Wallis test show significant differences between the stages of change and the use of the *taking control* strategy X^2 (2, N = 124) = 10.008, p = .007). Mean ranks for each of the three stages of change were 50.2 for precontemplation (PC), 71.6 for contemplation (C) and 68.7 for preparation (P).

Mann-Whitney tests were carried out to determine where the significance difference between the stages of change lay. Results from this indicate only one significant difference between the PC and C groups (U = 772.000, N^1 = 50, N^2 = 49, p = .001, two-tailed) in the use of the *taking control* strategy, with contemplators using this strategy more frequently than PCs. Mann-Whitney analysis indicated that there were no other significant differences between the remaining stages of change: PC and P (U = 465.000, N^1 = 50, N^2 = 25, p = .070, two-tailed); and C and P (U = 607.500, N^1 = 49, N^2 = 25, p = .954, two-tailed).

At T2, results from the Kruskal-Wallis test showed significant differences between the stages of change and the use of the *taking control* strategy X^2 (2, N = 78) = 10.669, p = .005). Mean ranks for each of the three stages of change were 35 for precontemplation (PC), 39.1 for contemplation (C) and 65.4 for preparation (P). Mann-Whitney tests were carried out to determine where the significance difference between the stages of change lay. Results from this indicate two significant findings between the stages of change groups in the use of the *taking control* strategy: PC and P (U = 28.000, N^1 = 37, N^2 = 7, p = .001, two-tailed); and C and P (U = 39.500, N^1 = 34, N^2 = 7, p = .006, two-tailed). Preparators used this strategy more frequently than those in PC and C stages. No significant differences were found between the remaining stages of change comparison: PC and C (U = 564.500, N^1 = 37, N^2 = 34, p = .456, two-tailed).

At T3, results from the Kruskal-Wallis test show significant differences between the stages of change and the use of the *taking control* strategy X^2 (2, N = 49) = 13.031 p = .001). Mean ranks for each of the three stages of change were 19.4 for precontemplation (PC), 26.2 for contemplation (C) and 42.5 for preparation (P). Mann-Whitney tests were carried out to determine where the significance difference between the stages of change lay. Results from this indicate two significant findings between the stages of change groups in the use of the *taking control* strategy: PC and P (U = 8.000, N^1 = 23, N^2 = 6, p = .001, two-tailed); and C and P (U = 16.000, N^1 = 20, N^2 = 6, p = .007, two-tailed). Again, preparators used this strategy more frequently than those in PC and C stages. No significant differences were found between the remaining stages of change comparison: PC and C (U = 162.500, N^1 = 23, N^2 = 20, p = .093, two-tailed).

Risk assessment and the stages of change

At T1, results from the Kruskal-Wallis test show significant differences between the stages of change and the use of the *risk assessment* strategy X^2 (2, N = 124) = 18.692, p = .001). Mean ranks for each of the three stages of change were 45.7 for precontemplation (PC), 75.2 for contemplation (C) and 71.2 for preparation (P). Mann-Whitney tests were carried out to determine where the significance difference between the stages of change lay. Results from this indicate two significant findings between the PC and C groups (U = 643.000, N^1 = 50, N^2 = 49, p = .001, two-tailed) and the PC and P (U = 366.000, N^1 = 50, N^2 = 25, p = .003, two-tailed), with PCs scoring lowest for use of the risk assessment strategy. No significant differences were found between the C and P stages (U = 570.000, N^1 = 49, N^2 = 25, p = .626, two-tailed).

At T2, results from the Kruskal-Wallis test showed significant differences between the stages of change and the use of the *risk assessment* strategy X^2 (2, N = 78) = 18.805, p = .001). Mean ranks for each of the three stages of change were 28.3 for precontemplation (PC), 47.8 for contemplation (C) and 58.3 for preparation (P). Mann-Whitney tests were carried out to determine where the significance difference between the stages of change lay. Results from this indicate two significant findings between the PC and C groups (U = 305.000, N^1 = 37, N^2 = 34, p = .001, two-tailed) and the PC and P (U = 38.500, N^1 = 37, N^2 = 7, p = .002, two-tailed), with PCs scoring lowest for use of the risk assessment strategy. No significant differences were found between the C and P stages in their use of the *risk assessment* strategy (U = 78.500, N^1 = 34, N^2 = 7, p = .158, two-tailed).

At T3, results from the Kruskal-Wallis test show significant differences between the stages of change and the use of the *risk assessment* strategy X^2 (2, N = 49) = 8.541, p = .014). Mean ranks for each of the three stages of change were 19.5 for precontemplation (PC), 27.8 for contemplation (C) and 36.9 for preparation (P). Mann-Whitney tests were carried out to determine where the significance difference between the stages of change lay. Results from this indicate two significant findings between the PC and C groups (U = 149.000, N^1 = 23, N^2 = 20, p = .046, two-tailed) and the PC and P (U = 22.500, N^1 = 23, N^2 = 6, p = .012, two-tailed). Again, PCs used this strategy significantly less frequently than those in the C or P stage. No significant differences were found between the C and P stages

in their use of the *risk assessment* strategy (U = 35.000, N^1 = 20, N^2 = 6, p = .125, two-tailed).

Helping Relationships and the stages of change

At T1, results from the Kruskal-Wallis test show significant differences between the stages of change and the use of the *helping relationship* strategy X^2 (2, N = 124) = 36.096, p = .001). Mean ranks for each of the three stages of change were 39.8 for precontemplation (PC), 75.8 for contemplation (C) and 82.1 for preparation (P). Mann-Whitney tests were carried out to determine where the significance difference between the stages of change was. Results from this indicate two significant findings between the PC and C groups (U = 522.000, N^1 = 50, N^2 = 49, p = .001, two-tailed) and the PC and P (U = 190.500, N^1 = 50, N^2 = 25, p = .001, two-tailed), with PCs using this strategy significantly less frequently than those in the C and P stages. No significant differences were found between the C and P stages (U = 557.500, N^1 = 49, N^2 = 25, p = .523, two-tailed).

At T2, results from the Kruskal-Wallis test show significant differences between the stages of change and the use of the *helping relationship* strategy X^2 (2, N = 78) = 18.587, p = .001). Mean ranks for each of the three stages of change were 29.2 for precontemplation (PC), 46.3 for contemplation (C) and 61.3 for preparation (P). Mann-Whitney tests were carried out to determine where the significant difference between the stages of change lay. Results from this indicate that there were significant differences between each stage of change in their use of the *helping relationship* strategy: PC and C groups (U = 336.500, N^1 = 37, N^2 = 34, p = .001, two-tailed); PC and P (U = 39.000, N^1 = 37, N^2 = 7, p = .002, two-tailed); and C and P stages (U = 57.000, N^1 = 34, N^2 = 7, p = .028, two-tailed). Thus, use of this strategy significantly increased as stages progressed.

At T3, results from the Kruskal-Wallis test again show significant differences between the stages of change and the use of the *helping relationship* strategy X^2 (2, N = 49) = 19.949, p = .001). Mean ranks for each of the three stages of change were 15.6 for precontemplation (PC), 33.1 for contemplation (C) and 34.2 for preparation (P). Mann-Whitney tests were carried out to determine where the significance difference between the stages of change lay. Results from this

indicate two significant findings between the PC and C groups (U = 56.000, N^1 = 23, N^2 = 20, p = .001, two-tailed) and the PC and P (U = 27.000, N^1 = 23, N^2 = 6, p = .017, two-tailed), with PCs using this strategy less frequently. No significant differences were found between the C and P stages (U = 47.000, N^1 = 20, N^2 = 6, p = .396, two-tailed).

Coping with the temptation to smoke and the stages of change

At T1, results from the Kruskal-Wallis test show significant differences between the stages of change and the use of the *coping with the temptation to smoke* strategy X^2 (2, N = 124) = 15.594, p = .001). Mean ranks for each of the three stages of change were 47.5 for precontemplation (PC), 71.1 for contemplation (C) and 75.6 for preparation (P). Mann-Whitney tests were carried out to determine where the significance difference between the stages of change lay. Results from this indicate two significant findings between the PC and C groups (U = 760.000, N^1 = 50, N^2 = 49, p = .001, two-tailed) and the PC and P (U = 338.500, N^1 = 50, N^2 = 25, p = .001, two-tailed), with PCs using this strategy the least frequently. No significant differences were found between the C and P stages (U = 571.000, N^1 = 49, N^2 = 25, p = .630, two-tailed).

At T2, results from the Kruskal-Wallis test show significant differences between each stage of change and the use of the *coping with the temptation to smoke* strategy X^2 (2, N = 78) = 6.726, p = .035). Mean ranks for each of the three stages of change were 34.2 for precontemplation (PC), 41.6 for contemplation (C) and 57 for preparation (P). Mann-Whitney tests were carried out to determine where the significance difference between the stages of change lay. Results from this found only one significant difference between the PC and P groups (U = 58.500, N^1 = 37, N^2 = 7, p = .020, two-tailed), with preparators using this more frequently. The remainder of the stages of change comparisons yielded no significant differences: PC and C groups (U = 504.500, N^1 = 37, N^2 = 34, p = .143, two-tailed); and C and P groups (U = 68.000, N^1 = 34, N^2 = 7, p = .073, two-tailed).

At T3, results from the Kruskal-Wallis test show significant differences between the stages of change and the use of the *coping with the temptation to smoke* strategy X^2 (2, N = 49) = 8.074, p = .018). Mean ranks for each of the three stages of

change were 19 for precontemplation (PC), 30.3 for contemplation (C) and 30.3 for preparation (P). Mann-Whitney tests were carried out to determine where the significance difference between the stages of change lay. Results from this found only one significant difference between the PC and C groups (U = 120.500, N^1 = 23, N^2 = 20, p = .006, two-tailed), with contemplators using this strategy more frequently than precontemplators. The remainder of the stages of change comparisons yielded no significant differences: PC and P groups (U = 40.500, N^1 = 23, N^2 = 6, p = .114, two-tailed); and C and P groups (U = 56.500, N^1 = 20, N^2 = 6, p = .826, two-tailed).

In order to visually examine the differences in the SCS-CS questionnaire scores and the stages of change at T1, Figure 13 is presented below.

Figure 13: Reported use of SCS by stage of change

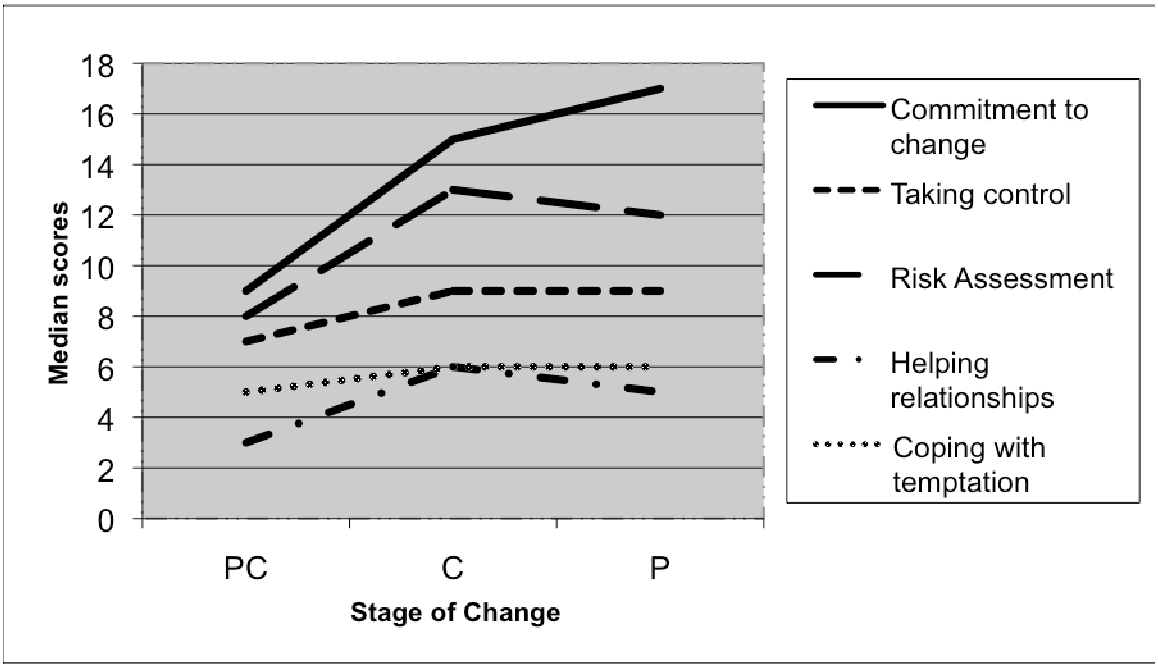


Figure 13 above shows that the most frequently used self-change strategy in all stages is *commitment to change*, and the least frequently used strategy is *helping relationships*. The largest variation between the stages in reported use is also observed in the *commitment to change* strategy, with commitment increasing as individual's progress through the stages. As observed in Figure 13 above, overall, precontemplators tended to use self change strategies least frequently. Contemplators were found to use *taking control*, *risk assessment* and *helping relationships* most frequently. Preparators used both *commitment to change* and

coping with the temptation to smoke most frequently. The largest observable difference in use of self change strategies is between individuals in the precontemplation stage and those in the contemplation and preparation stages.

8.7.4 SCS-CS and daily cigarette consumption (DCC)

Analysis was carried out to determine if the self change strategies were correlated to participant's daily cigarette consumption (DCC). As initial analysis of the SCS-CS questionnaire indicated that the normality scores on the strategies violated normality assumptions, the non parametric test of correlation, Spearman's *r* was chosen to assess correlations. Table 11 below shows Spearman's *r* results over time for each of the self change strategies.

Table 11: Correlation analysis results for DCC and the SCS-CS over time

	Time Intervals					
	T1 (n =124)		**T2** (n = 78)		**T3** (n = 49)	
Variable	r_s	*p*	r_s	*p*	r_s	*p*
Commitment to change	-.020	.823	-.004	.970	.041	.779
Taking control	-.448**	.001	-.496**	.001	-.625**	.001
Risk assessment	.002	.985	-.104	.363	-.188	.195
Helping relationships	.111	.218	-.185	.106	-.246	.088
Coping with temptation	-.166	.066	-.170	.136	-.071	.630

*Correlation is significant at the 0.01 level

As Table 11 above shows, the only significant correlations are found between DCC and the taking control self change strategy. This finding is seen across all time points and is indicative of a medium strength association (Dancey & Reidy 2002). Thus, as scores for use of the taking control strategy increase, daily cigarette consumption decreases.

8.7.5 Summary

When post ban time intervals (T2 and T3) were compared to baseline (T1), participants reported a significant increase in their use of the *taking control* strategy. An examination of confounding factors found that woman used the *coping with the temptation to smoke* strategy more frequently than men at T3. Little difference was observed when age groups were compared in their use of SCS over time. Within education, participants with the highest level of education were found to use the *taking control* strategy more frequently than those with lower education levels. The results obtained from the examination of the stages of change and SCS indicated mixed variability over time, with many time interval analyses demonstrating different results. However, in general the cognitive strategy of *commitment to change* was shown to increase in use as the stages progressed. For the cognitive strategy of *risk assessment,* precontemplators were shown to make significantly less use of this strategy when compared to those in the contemplation and preparation stages. For the behavioural strategy of *taking control,* at T1 the only significant finding was that contemplators used this strategy more frequently than precontemplators. However, at T2 and T3 preparators were shown to use this strategy more frequently than those in the PC and C stages. The remaining behavioural strategy, *helping relationships*, showed that PCs made less use of this strategy than those in the C and P stages at T1 and T3. Results from T2 demonstrated that the use of this strategy increased as stages progressed. Finally, the strategy of *coping with the temptation to smoke*, which incorporates both cognitive and behavioural elements, demonstrated that PCs used this strategy significantly less than those in the C and P stages at T1. At T2 and T3, the only significant difference found was that PCs used this strategy less than those in the P stage. In general, findings demonstrates that those participants in the precontemplation stage tended to make significantly less use of all SCS than did those in the contemplation and preparation stages. The use of the commitment to change strategy was the most frequently used strategy by all groups. Finally, DCC was found to be significantly correlated with the use of the taking control strategy. Across all time intervals, as the use of the taking control strategy increased, DCC decreased.

8.8 Decisional balance – pros and cons of smoking

Attitudes towards smoking scale (ATS-18) Questionnaire

Participants were questioned on their attitudes towards smoking using the ATS-18 scale and these responses were used to assess the decisional balance measure of the transtheoretical model of change (TTM). The differences in the subscales of the ATS-18 were examined over time. Table 12 below shows the means, standard deviations and confidence intervals, demonstrating attitudes towards the pros and cons of smoking.

Table 12: Average ATS-18 scores for each time sub-scale over time

	Time Intervals		
	T1 (n =125)	**T2** (n = 88)	**T3** (n = 55)
Variable	M SD	M SD	M SD
Adverse effects	21.7 8.0	22.1 8.9	21.7 8.5
Confidence Interval (CI)	*20.3 – 23.2*	*20.1 – 24.2*	*19.3 – 24.1*
Psychoactive benefit	9.5 3.7	9.5 3.9	9.2 3.9
Confidence Interval (CI)	*8.9 – 10.2*	*8.6 – 10.4*	*8.1 – 10.4*
Pleasure of smoking	12.5 3.8	12.6 3.9	12.3 3.8
Confidence Interval (CI)	*11.8 – 13.2*	*11.7 – 13.5*	*11.2 – 15.4*

As Table 12 above shows, there is very little variation in the ATS-18 subscales when responses for the sample are compared across time. Normality analysis for each of the subscales was analysed over time using normality plots and the Kolmogorov-Smirnov statistic. Normality results are presented below for each of the ATS-18 subscales.

Adverse effects of smoking (con)

Normality results obtained from the Kolmogorov-Smirnov (KS) statistic indicated that T1 (.040) and T2 (.006) scores on the *adverse effects of smoking* scale violated the assumption of normality. However, analysis for T3 indicated that these scores were normally distributed (KS = .173) at this time point.

Psychoactive benefits of smoking (pro)

Normality results obtained from the Kolmogorov-Smirnov (KS) statistic indicated that T1 (.067) and T3 (.200) scores on the *psychoactive benefits of smoking* scale met the assumptions for normality. However, analysis at T2 indicated that the scores were not normally distributed (KS = .002).

Pleasure of smoking (pro)

For this subscale, normality results obtained from the Kolmogorov-Smirnov (KS) statistic indicated that T2 (.115) and T3 (.200) scores met the assumptions for normality. However, analysis at T1 indicated that the scores were not normally distributed (KS = .021).

In all of the preceding normality analyses, data was transformed to determine if this significantly altered the normality distributions. Transformations did not significantly differ when the raw and transformed data were compared, therefore the raw data was obtained for formal analysis.

Group 1

These individuals provided data at all three time intervals, T1, T2, and T3 (n = 44, 34.6% of the sample). Formal analysis of the data was conducted with a non parametric test, the Friedman test. This formally assessed the differences in each of the subscales over time. Initially examining the *adverse effects of smoking* (con) subscale, the mean ranks provided by the Friedman results indicated little variation over time (T1 = 1.93, T2 = 2.01, T3 = 2.06) and this result failed to reach significant levels X^2 (2, N = 44) = 4.31, p = .806). When differences in the *psychoactive benefits of smoking* (pro) subscale were observed over time, again no significant differences were found. Friedman mean ranks, T1 (1.98), T2 (2.20) and T3 (1.82) and X^2 (2, N = 44) = 4.79, p = .091). Finally, examining the subscale of reported *pleasure of smoking* (pro) again showed no significant differences in the use of this subscale over time. Friedman mean ranks, T1 (2.14), T2 (1.86) and T3 (2.00) and X^2 (2, N = 44) = 2.22, p = .329).

Group 2

Individuals who provided data at T1 and T2 were classified into Group 2 (*n* = 78, 61.4% of the sample). Formal analysis of the data was conducted using a non-parametric test, the Wilcoxon Signed-Rank test, to compare differences between these two groups. Formal analysis from this test demonstrated no significant differences between the groups in all three ATS-18 questionnaire subscales at T1 and T2: *adverse effects of smoking*, *z* = -.387, *N* - ties = 66, *p* = .699, two tailed; *psychoactive benefits of smoking*, *z* = -.125, *N* - ties = 54, *p* = .900, two tailed; and *pleasures of smoking*, *z* = -.152, *N* - ties = 56, *p* = .879, two tailed.

Group 3

Individuals who provided data at T1 and T3 were classified into Group 3 (*n* = 49, 38.6% of the sample). The Wilcoxon Signed-Rank test was used to compare differences between these two groups in the three subscales of the ATS-18 questionnaire. The results indicated that no significant differences were found for each of the three subscales at T1 and T3: *adverse effects of smoking*, *z* = -.485, *N* - ties =40, *p* = .628, two tailed; *psychoactive benefits of smoking*, *z* = -.612, *N* - ties = 30, *p* = .541, two tailed; and *pleasures of smoking*, *z* = -.791, *N* - ties = 44, *p* = .429, two tailed.

8.8.1 ATS-18 and age, gender and education level

As the above data was not able to be analysed with parametric statistical techniques, one was unable to control for the possible influences of confounding factors including age, gender and education level. The descriptive scores and standard deviations for each of the ATS-18 subscales were visually examined for each of the variables above, to assess whether there were any observable differences. Whilst medians, means and SDs showed small fluctuations, little difference was observed in the ATS-18 subscales when gender and education level were compared. For age, little difference was observed in the subscales of *psychoactive benefits* and *pleasures of smoking* across age categories. However, when the *adverse effects of smoking* subscale was examined, some differences were associated with age. It appeared that the older smokers rated the *adverse effects of smoking* as higher than the younger smokers did and this seemed to gradually increase as age increased. For 18-24 years of age (mean = 18.65); 25-

34 years of age (mean = 19.24); 35-44 years (mean = 22.36); 45-54 years (mean = 23); and 55-64 (mean = 27.18). The largest difference in mean scores can be seen between the youngest and oldest age groups.

8.8.2 ATS-18 and the stages of change

Based on the literature review, our hypothesis predicted that smokers in the earlier stages of change (Precontemplation (PC) and Contemplation (C)), will view the pros of changing their behaviour as low, and the cons of changing their behaviour as high. In the latter stages of the model (Preparation (P) and Action (A)), the reverse pattern should emerge showing higher levels of pros and lower levels of cons reported in relation to changing smoking behaviour. Within the ATS-18, pros of smoking behaviour are indicated by the subscales *psychoactive benefits of smoking* and *pleasure of smoking*. Cons of smoking are indicated by the *adverse effects of smoking* subscale.

Initial examination of the ATS-18 subscales in relation to stages of change indicated that assumptions for normality were met. This was assessed via the use of normality plots, showing each subscale against each stage of change over time. In addition, none of the Kolmogorov-Smirnoff statistics for each of the above descriptives reached significant levels (p=<.05), indicating normality. Therefore further analysis could be carried out with parametric statistical techniques to compare differences amongst the groups. Initially, a multivariate analysis of variance (MANOVA) was considered to explore whether participant's perspectives on the pros and cons of smoking varied dependent on their stages of change classification. However, results from the ATS-18 subscales indicated that some of the subscales were significantly correlated with each other. For example, both *psychoactive benefits of smoking* and *pleasure of smoking* were found to be significantly correlated (r = .326, n = 125, p = .001). Additionally, *psychoactive benefits of smoking* was also found to correlate significantly with the *adverse effects of smoking* (r = .206, n = 125, p = .021). As correlated dependent variables diminish the power of MANOVA (Tabachnick & Fidell 2001), it was deemed most appropriate to examine each of the ATS-18 subscales in turn using ANOVAs.

Adverse effects of smoking and the stages of change

ANOVAs were carried out to determine how the scoring on the *adverse effects of smoking* subscale (cons) of the ATS-18 differed when examined in relation to the stages of change. This was conducted for each time interval. At T1, there was a statistically significant effect of the stages of change and the *adverse effects of smoking* indicating that scores on this subscale differed dependent on which stage of change a participant was classified in ($F(2,122) = 20.871$, $p = .001$, partial $\eta^2 = .26$). A post hoc analysis was carried out to examine where these differences were found. Employing the Bonferroni post-hoc test, significant differences were observed between the precontemplation (PC) and contemplation (C) stages and the precontemplation (PC) and preparation (P) stages ($p = .001$). There were no significant differences between the C and P stages in the adverse effects of smoking score ($p = 1$). Similar findings were observed at both T2 and T3. At T2, significant differences were found in the scores of the *adverse effects of smoking* subscales ($F(2,74) = 12.58$, $p = .001$, partial $\eta^2 = .25$) and Bonferroni analysis showed these were observed between PC and C ($p = .001$) and PC and P ($p = .016$). Non significant differences were found between C and P ($p = 1$). Again at T3, significant differences were observed ($F(2,46) = 4.69$, $p = .014$, partial $\eta^2 = .17$). Bonferroni post-hoc tests, demonstrated that these significant differences were observed between the PC and P stages ($p = .033$) only. Non significant differences were found between PC and C ($p = .082$) and C and P ($p = .817$). Therefore, those in the PC stage scored significantly lower on the *adverse effects of smoking* subscale when compared to individuals in the C and P groups.

Psychoactive benefits of smoking and the stages of change

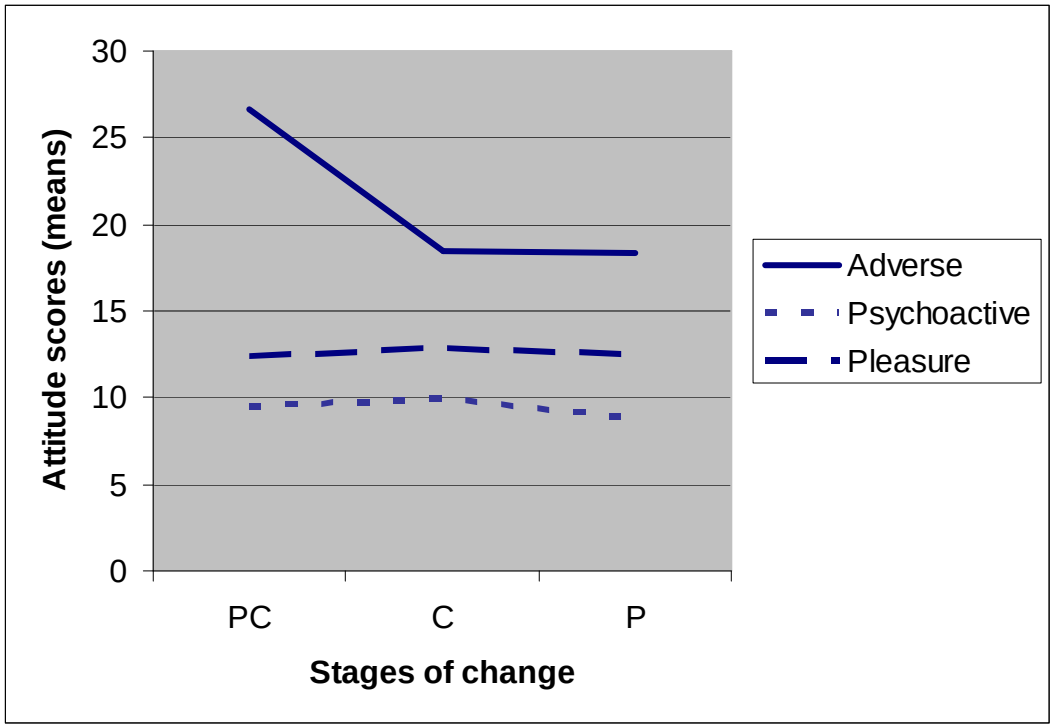
ANOVAs were conducted to determine how the scoring on the *psychoactive benefits of smoking* subscale (pros) of the ATS-18 differed when examined in relation to the stages of change. This was conducted for each time interval. Analysis at all three time intervals demonstrated non significant findings, indicating that there were no differences in scores of the *psychoactive benefits of smoking* in relation to stages of change classification. At T1, ($F(2,122) = .735$, $p = .482$, partial $\eta^2 = .012$). At T2, ($F(2,74) = 1.896$, $p = .157$, partial $\eta^2 = .049$). Finally, at T3, ($F(2,46) = 1.333$, $p = .274$, partial $\eta^2 = .055$).

Pleasure of smoking and the stages of change

Similarly, ANOVAs were carried out to determine how the scoring on the *pleasure of smoking* subscale (pros) of the ATS-18 differed when examined in relation to the stages of change. This was conducted for each time interval. Analysis at all three time intervals demonstrated non significant findings, indicating that there were no differences in scores of the *pleasures of smoking* in relation to stages of change classification. At T1, ($F(2,122) = .219$, $p = .804$, partial $\eta^2 = .004$). At T2, ($F(2,75) = .694$, $p = .503$, partial $\eta^2 = .018$). Finally, at T3, ($F(2,46) = .063$, $p = .939$, partial $\eta^2 = .003$).

In order to visually examine the differences in the ATS-18 subscale scores and the stages of change at T1, Figure 14 is presented below.

Figure 14: Smoking pros and cons for three stages of change



As confirmed by the formal analysis conducted above, Figure 14 shows relatively little differentiation in the pros of smoking across the stages of change as measured with the *psychoactive benefits* and *pleasures towards smoking* subscales. However, a clear differentiation can be observed when examining the cons of smoking, with those in the precontemplation phase scoring higher scores

(indicating less agreement) than both those in the contemplation and preparation stages on the *adverse effects of smoking* subscale.

8.8.3 ATS-18 and daily cigarette consumption (DCC)

Analysis was carried out to determine if the subscales of the ATS-18 were correlated to participant's daily cigarette consumption (DCC). As initial analysis on the ATS-18 in relation to DCC indicated that the normality scores on the subscales changed over time, and at some time points violated normality assumptions, the non parametric test of correlation, Spearman's *r* was chosen to assess correlations. Table 13 below shows Spearman's *r* results over time for each of the ATS-18 subscales.

Table 13: Correlation analysis results for DCC and the ATS-18 sub-scales over time

	Time Intervals					
	T1 (n =125)		**T2** (n = 77)		**T3** (n = 49)	
Variable	r_s	*p*	r_s	*p*	r_s	*p*
Adverse effects	.012	.899	.057	.620	-.011	.940
Psychoactive benefit	-.233	.009**	-.150	.194	-.275	.055
Pleasure of smoking	-.189	.035*	-.084	.467	-.241	.095

*Correlation is significant at the 0.05 level
*Correlation is significant at the 0.01 level

As Table 13 above shows, the only significant correlations are observed at T1, however, the strength of these relationships is relatively weak (Dancey & Reidy 2002). Nevertheless, these figures reach significance. Thus, as scores on the psychoactive benefits strategy and pleasures of smoking strategy (pros) decrease, so does daily cigarette consumption.

8.8.4 Summary

Analysis of the ATS-18 questionnaire showed no significant differences in the sample's assessment of the pros and cons of smoking over time. Little variation was seen when the sample was examined in relation to age and gender. However, it appeared that older individuals rated the cons of smoking, *adverse effects*, more highly when compared to those in younger age groups. Whilst no significant differences were observed when the pros of smoking, *psychoactive benefits* and *pleasure of smoking*, were compared across stage classification, the cons of smoking showed some significant differences. Precontemplative individuals showed less agreement with the *adverse effects of smoking* when compared to those in the contemplation and preparation stages. Finally, in relation to daily cigarette consumption as scores on the pros of smoking decreased (psychoactive benefits strategy and pleasures of smoking strategy), so did DCC.

8.9 Addiction

Fagerstrom Test for Nicotine Dependence (FTND) Questionnaire

At all time intervals, the overall FTND total scores appeared positively skewed and ranged from 0 (Minimum) to 10 (Maximum). At T1, 54% of the sample reported their nicotine addiction levels as low or very low. In contrast, 29% of the sample reported their addiction as high or very high. The remainder of the sample were classified as having a medium addiction (17%). A similar pattern of addiction was reported by the sample at T2 and T3. Table 14 below shows descriptive statistics and normality scores over time.

Table 14: FTND descriptive statistics and normality scores over time

	Descriptives			
Time Intervals	*Mean*	*SD*	*K-S**	*Sample size*
T1	4.10	2.65	.001	126
T2	3.85	2.68	.021	79
T3	3.84	2.66	.065	49

* Kolmogorov-Smirnov (KS) statistic

As Table 14 above shows, whilst FTND total scores at T3 were normally distributed, scores at T1 and T2 violated normality assumptions. These scores were transformed using a square root transformation, as the data was positively skewed (Tabachnick & Fiddell 2001). However, this had little effect on the KS statistic (T1 = .000; T2 = .004), therefore raw data was obtained for inferential analysis. This analysis was conducted using non parametric statistical techniques. As in previous sections, groups were split for analysis based on the times intervals they returned their data.

Group 1

Individuals at Group 1 returned data at all time intervals, T1, T2 and T3 (*n* = 44, 34.6% of the sample). The Friedman test was used to formally assess the

differences in addiction scores over time. The mean ranks provided by this analysis indicated little variation in addiction scores over time (T1 = 2.01, T2 = 2.03, T3 = 1.95), and this result failed to reach significant levels X^2 (2, N = 44) = .236, p = .889).

Group 2

Individuals who provided data at T1 and T2 were classified into Group 2 (n = 78, 61.4% of the sample). The Wilcoxon Signed-Rank test was used to compare differences between these two groups. Formal analysis demonstrated no significant differences between the addiction scores between these two groups at T1 and T2: z = -.459, N - ties =43, p = .646, two tailed.

Group 3

Individuals who provided data at T1 and T3 were classified into Group 3 (n = 48, 37.8% of the sample). The Wilcoxon Signed-Rank test was used to compare differences between these two groups. Formal analysis demonstrated no significant differences between the addiction scores of these two groups at T1 and T3: z = -1.187, N - ties =28, p = .235, two tailed.

8.9.1 FTND and confounding variables

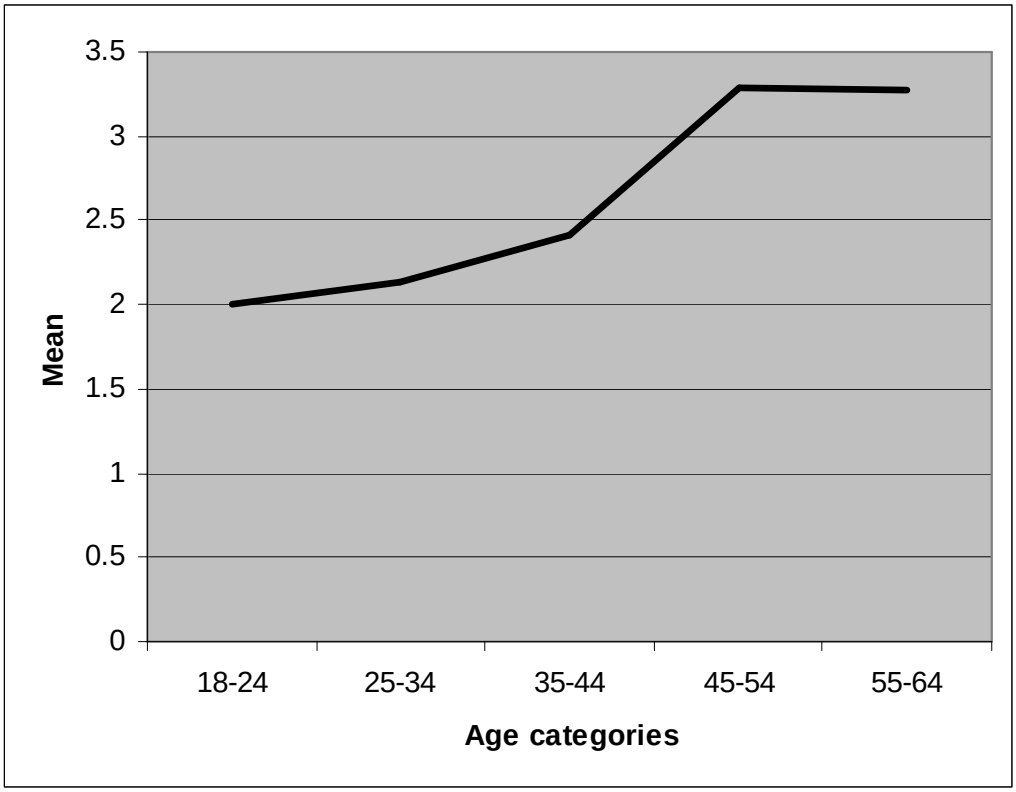
Gender

When FTND total scores at T1 were compared across the sexes, the total distribution of the scores was approximately equal across both males and females. The median scores for both categories was 4. The mean FTND score was 4.2 for females (SD=2.80) and 3.9 for males (SD=2.40). Similar patterns of addiction across gender categories were observed at T2 and T3.

Age

Total addiction scores for the FTND were then examined in relation to age at T1. Figure 15 below shows a line graph comparing the average FTND total addiction score across age categories.

Figure 15: FTND scores across age groups



As detailed in Figure 15 above, total addiction scores increased with age, with the lowest addiction score reported in the 18-24 year age group. Addiction peaks at 45-54 years and levels off at 55-64 years of age. The addiction score for age category 65-74 years, was omitted from this graph as only one of the participants fell into this group. A similar pattern of addiction scores was observed between age and addiction at T2 and T3.

Education level

The total FTND addiction score was examined in relation to the obtained educational level of the participants at T1. Table 15 below shows the descriptive statistics for education level in relation to addiction scores.

Table 15: Education level and FTND addiction scores

Descriptives

Education level	*Mean*	*SD*	*Median*	*Sample size*
Standard Grade	3.24	1.41	4	49
Higher	2.32	1.34	2	38
Undergraduate degree	1.84	1.02	2	19
Post graduate degree	1.50	0.41	1	14

As Table 15 above shows, education appears to have an influence on addiction scores; as the level of education increases, addiction scores decreases. The highest addiction score is seen in participants who only obtained standard grade qualifications. The lowest addiction score was observed in participants who hold a postgraduate degree.

8.9.2 FTND and the Stages of Change

The next stage of data analysis aimed to test the hypothesis that smokers in the precontemplation (PC) stage of the model would be most addicted to cigarettes, followed by those in the contemplation (C) and preparation (P) stages. Initial examination of the FTND addiction score in relation to the stages of change indicated that assumptions for normality were violated, with each of the Kolmogorov-Smirnoff statistics equalling .001. Therefore, analysis of the addiction score in relation to stages of change was conducted with the use of a non-parametric test, the Kruskal- Wallis. Results from the Kruskal-Wallis indicated that there were no significant differences between the stages of change and levels of addiction at all three time points. At T1, mean ranks for each of the three stages of change were 63.7 (PC), 64.1 (C) and 61.9 (P). No significant differences were observed between addiction score and stages of change: X^2 (2, N = 126) = .062, p = .970). At T2, mean ranks for each of the three stages of change were 39.6 (PC), 31.5 (C) and 41.7 (P). No significant differences were observed between addiction score and stages of change: X^2 (2, N = 79) = .113, p = .945). At T3, mean ranks

for each of the three stages of change were 25.1 (PC), 24.4 (C) and 25.6 (P). No significant differences were observed between addiction score and stages of change: X^2 (2, N = 49) = .054, p = .973). Therefore, analysis demonstrated that there were no differences on addiction scores based on stages of change classification.

8.10 Summary

Examination of the sample's nicotine addiction scores demonstrated no significant differences over time, with addiction scores remaining relatively static. Whilst addiction patterns did not vary between the genders, total addiction scores were found to increase as age progressed. In addition, addiction was shown to increase as levels of education decreased. No significant differences were shown when addiction levels were compared across stages of change classification, with each stage reporting similar levels of addiction.

Chapter 9

Discussion

The present study tested a number of hypotheses related to smoking behaviours and attitudes of current Scottish smokers. The Transtheoretical Model of Change (TTM) was used as the theoretical background for the research and results were interpreted using this framework. The research was longitudinal in nature and examined smoking behaviours prior to the introduction of Scottish anti-smoking legislation and at two time points after the ban was implemented. The current research had two primary aims, the first to examine if the introduction of the smoking ban affected smoker's smoking behaviours and data was collected concerning individual's daily cigarette consumption and quit attempts. In addition, smoker's attitudes towards the smoking ban were examined over time to explore how these may alter after the ban had been implemented. Hypotheses formed in relation to these aims stated that the introduction of the smoking ban should result in lower levels of daily cigarette consumption and an increase in quit attempts. Additionally, positive attitudes towards the ban were hypothesised to increase after the legislation had been implemented.

The second primary aim of the research was to test the theoretical predictions of the TTM. Core constructs of the TTM, including the decisional balance scale and processes of change, were analysed to examine if they accurately predicted stages of change membership. Moreover, changes in individual's stage classification were examined in relation to the introduction of the smoking legislation. Hypotheses formed in relation to these aims stated that individuals in earlier stages of the TTM would use more cognitive strategies and those in the later stages would more frequently use behavioural change strategies. In addition, smokers in the earlier stages of change would view the pros of changing their behaviour more negatively than those in the later model stages. Furthermore, individuals in the early stages of the model would view the cons of changing their smoking behaviour as high and those in the later stages would view the cons of changing as low. Smokers in the preparation stage were also hypothesised to demonstrate further stage progression than those in the precontemplation or contemplation stages of the model, due to the action based smoke-free intervention. Finally, the introduction of the smoking ban was hypothesised to impact positively and progress individuals along the stages of change continuum.

9.1 Smoking behaviours and attitudes towards the ban

The results obtained indicated conflicting findings when exploring rates of daily cigarette consumption (DCC) in the current sample. The difference in the findings may be related to the alternative methods of data collection. The continuous method of self reported rates of cigarette consumption found no significant differences in cigarette consumption when pre and post ban rates were compared. Conversely, when cigarette consumption was examined using a categorical classification, a significant decrease in cigarette consumption was reported over time. These alternative findings may be attributed to the fact that the continuous method of collecting DCC was not a validated measure. Rather, the researcher developed a simple question asking individuals to report their cigarette consumption and the response was left blank for participants to input their own answer. Whilst this was piloted for comprehension, no validity tests were carried out. In contrast, the categorical measure of DCC was collected using the FTND (Heatherton, Kozlowski, Frecker & Fagerstrom, 1991), a well validated and utilised questionnaire for assessing nicotine dependence. It is also possible that the continuous measure was not sensitive enough to detect small changes along a continuous scale, and a difference in the number of cigarettes smoked could not be detected when using this measure. Conversely, the categorisation measure used a small number of categories (four) which may be more sensitive in detecting change. The categories dictate a smaller field in which to observe movement, and therefore changes in categorisation can be more easily observed using this method. As half of the participants reported cutting down on cigarette consumption after the introduction of the smoking ban, one could hypothesise that the categorical measure may have been more accurate in detecting change.

Previous research has indicated that the introduction of smoke-free legislation results in a decrease in DCC (Anonymous, 2005; Chapman et al. 1999; Fichtenberg & Glantz 2002; Gallus et al. 2006). Therefore, these findings provide further weight for accepting the validated, categorical DCC results indicating decreases in cigarette consumption after the introduction of smoke-free legislations. However, it is important here to note a limitation of the current research. With no control group created in the study design, one is not able to attribute the decrease in DCC directly to the introduction of the smoke-free legislation. Rather, one can only state that this change occurred over time.

Moreover, the current study obtained a small sample size in relation to the total number of smokers within Scotland. It is very unlikely that this smoke-free population level intervention would have a large enough effect to be detected in such a small sample size. Such a reduction in daily cigarette consumption is generally only observed in population wide measurements of smoking behaviours (West, personal correspondence, 2008). This suggests that the continuous measure of DCC may be a more accurate reflection of the true findings obtained from this sample.

Whilst a 4% increase in quit ratios was reported at T2, at T3 quit attempts returned to the same level as baseline (T1). However, approximately 10% of the sample indicated that they had quit smoking after the ban implementation. Whilst previous studies have indicated that smoke-free legislation results in an increase in quit attempts (e.g. Longo et al.1996; & Moskowitz, Lin and Hudes, 2000), this research compared areas where smoke-free legislation was introduced, with control groups who experienced no such legislation. Obviously, these research designs allows a direct comparison and are therefore accurately able to attribute the changes in quit attempts to the smoke-free legislation. Unfortunately, due to the circumstances of the current study, no control group was utilised and therefore the author cannot ascertain any direct relationship between quit attempts and the introduction of the smoking ban. Moreover, the fact that 10% of the sample reported quitting smoking post-ban cannot be related directly to the legislation, as research suggests that smoking prevalence has been decreasing each year (Clearing the Air Scotland, 2007). Limitations of the current research will be explored in greater depth later in the chapter.

When attitudes towards the smoking ban were examined, results demonstrated a 20% increase in support for the ban when baseline attitudes were compared to attitudes six months after the ban implementation. Individuals were more in favour of a complete ban on indoor smoking as time progressed. This finding reflects results from previous research showing that support for the ban increases after the introduction of smoke-free legislations (Ash, 2006; Gallus et al. 2006; Heloma & Jaakkola 2003; La Vecchia et al. 2001; & Tang et al. 2003). Moreover, this finding could be attributed to the influence of a change in social norms. Individual smoking behaviours are influenced by the tobacco control policy (West 2007a),

and consequently being forced to smoke outdoors provides a social message that smoking is less socially acceptable. Therefore in light of predictions from social comparison theories, individuals may change their views to realign them with their societal and group norms, in which smoking is growing to be a less acceptable habit (Festinger 1954 & Bandura 1977). In addition the smoking ban may influence motivational factors towards smoking (West 2007a) and increase the attraction of becoming a non smoker. Heloma & Jaakkola (2003) also suggested that smoke-free legislation is powerful in influencing social norms, and 'new' modelling behaviours may shape acceptance of non-smoking as a 'normalised' form of behaviour.

9.2 The transtheoretical model of change (TTM)

9.2.1 Processes of change

In examining the role of processes of change, results indicated that participants significantly increased their use of the *taking control* strategy when post ban scores were compared to those collected at baseline (pre-ban). Therefore it appears that the introduction of the smoke-free legislation resulted in individuals feeling more able to take control of their smoking behaviours. Logically, this appears understandable as controlling where smoking can take place enables individuals to make a more informed choice about where and when to carry out their smoking behaviours. It may assist in cutting down on the habitual nature of smoking and therefore individuals may make more "conscious" choices to partake in smoking. This increase in control may impact on participant's self-efficacy and result in them feeling more confident about making positive changes in relation to their smoking behaviours (Bandura 1977). As daily cigarette consumption was found to decrease as the use of the taking control strategy increased, this adds further validation to the findings, suggesting that use of this strategy can be directly related to positive changes in participants' smoking behaviours.

Education was also found to impact on the use of the taking control strategy and individuals with higher levels of education reported more frequent use of taking control when compared to participants with lower levels of education. This may be a result of locus of control, with individuals with higher education qualifications feeling that they have more control over their lives. They have been able to make choices to continue with further education, increasing self-efficacy and confidence

in their ability to control their own destiny. Conversely, individuals with low levels of education may not have as many options available to them and this may contribute to them feeling less able to take control of their own actions.

The use of the remaining processes of change was not found to significantly alter when pre and post ban scores were compared. Therefore, the use of commitment to change, risk assessment, coping with the temptation to smoke and the use of helping relationships did not significantly alter in this sample over time. It may be that these processes were not directly influenced by the smoke-free legislation, for example coping with the temptation to smoke included items such as “I take deep breaths to fight off the desire to smoke”. However, one would anticipate that processes including commitment to change and risk assessment would act as moderator variables in the relationship between the smoke-free legislation and smoking behaviours. However, no significant differences were found in the use of the processes of change over time. This may be indicative of the large drop out rate, resulting in small sample sizes at T2 and T3.

Results obtained concerning the relationship between the stages of change and the use of processes of change indicated mixed variability over time. However, in general, those participants in the precontemplation stage tended to make significantly less use of all the self-change strategies than did those in the contemplation and preparation stages. This finding is explanatory in that individuals who are not thinking or planning on change will fail to employ processes of change. It makes inherent sense that individuals who are contemplating or preparing for change will employ the use of processes of change more frequently than those who are not planning to change their smoking behaviours. This finding offers some support for Prochaska et al.’s (1991, 1998) prediction that processes of stage are related to stages in a curvilinear function (the use of processes are low in the precontemplation stage, increase in the middle stages and then decrease again in the latter stages of the model) and illustrates differences between those changing (cognitively and behaviourally) and those not changing. However the findings obtained fail to add support to the proposal of distinct and exclusive stages of change. As results tend to support differences between PC vs. C and P, with little significant differences found

between C and P individuals, they cannot be taken as support for different processes being utilised in alternative stages of change.

Furthermore, the results obtained in relation to the TTM did not clearly support the study's hypothesis that individuals in earlier stages would use more cognitive strategies and those in the later stages would more use more behavioural change strategies (Munro et al. 2007; Perz, DiClemente & Carbonari 1996 & Prochaska et al. 1998). Examining the use of cognitive strategies of change, results demonstrated that the use of the commitment to change strategy increased as stages progressed. This shows a reverse pattern to the hypothetical predictions of the TTM. In relation to the cognitive strategy of risk assessment, precontemplators (PC) actually made less use of this strategy when compared to individuals in the contemplation (C) and preparation (P) stages. Again, this is not reflective of the TTM's theoretical predictions, demonstrating an inverse relationship to the one predicted. Examining participant's use of the behavioural strategies of change also shows mixed variability, however the findings are more supportive of the TTM predictions. In general, the use of the helping relationship strategy showed that the use of this increased as the stages progressed and that PCs used this strategy less frequently than those in the C and P stages. In terms of the taking control strategy, findings over time were mixed, but T1 analysis showed that Cs made significantly more use of this strategy than PCs. At T2 and T3 preparators were found to use this strategy more often than those in the PC and C stages. The remaining strategy, coping with the temptation to smoke, incorporated both cognitive and behavioural elements. Results indicated that at T1 PCs used this strategy less frequently than those in the C and P stages. However, at T2 and T3, findings only demonstrated a significant result between PCs and Ps, with P using the strategy most often.

Therefore, the data obtained failed to find any expected relationships between a participant's stage of change and their use of cognitive processes. In fact, the data represented a reverse relationship to the one predicted, with those in the earlier stages employed this strategy less frequently. If we examine the results obtained from the behavioural strategies, again no clear relationship emerges. However, in general, results demonstrated that those in the first stage of the model, PC, used significantly less processes overall than individuals in the C and

P stages. The data does not clearly support different strategies being used in every stage, rather it seems to suggest that the only discernible difference is between those not planning to change (PCs) and those either thinking (C) or preparing for change (P). The results did offer some support to the theoretical predictions of the transtheoretical model, for example individuals in different stages were found to use different processes/strategies to change their smoking behaviours. However, the data did not find clear division of strategies for each of the three stages and processes were not often found to differ between the C and P stages. In addition, the expected relationship of cognitive processes to behavioural intention and behavioural processes to actual behaviour were not supported. Whilst some additional use of behavioural strategies were found to increase in the later stages, data tended to only support a difference between PC and the later stages. Moreover the predicted relationship between cognitive strategies and stages actually showed a reverse pattern to the TTM predictions and the use of these strategies was found to increase as time progressed.

One possible explanation for the findings could be that the current study did not use Prochaska et al.'s Processes of Change Scale, which is specifically designed to explore the processes construct of the stages of change model. Rather, this project intended to support the model's empirical base by using an alternative measure to explore the role of cognition and behaviour in shaping behaviour across the stages. One would hypothesise that if "thinking" processes were observed more frequently in earlier stages of the model, and "behavioural" processes used more frequently in the latter model stages, then other measures examining the cognitive and behavioural processes of changing smoking behaviours would also show a similar relationship. Obviously this was not the case in the current project. Whilst the questionnaire chosen, the Self-Change Strategies in Current Smokers (SCS-CS), has been well validated and used successfully in relation to the TTM (Etter, Bergman and Perneger 2000), it has not been as widely used as the Processes of Change Scale. However as the SCS-CS has been validated as a measure exploring the use of strategies of change for smoking behaviours, it should therefore be capable of measuring the different types of processes that smokers use to change their smoking behaviours. Tentative results using the SCS-CS in relation to the stages of change model have found that different processes can be attributed to an individual's stage of change (Etter, Bergman and Perneger 2000). As differences in the use of the processes

across the stages of change were observed in the results, this suggests that the SCS-CS is an accurate measure for determining the use of processes. However, the theoretical predictions of the TTM were not fully supported, and the model's hypotheses in relation to the cognitive and behavioural processes were not accurately observed across each stage.

A further possible explanation for the finding that different processes of change could not be attributed to a specific stage of change may be that critics of the TTM are correct when they suggest that stages are not quantitatively different categories. These critics (e.g. Bandura, 1997; Davidson, 2002; Marshall & Biddle 2001; Weinstein, Rothman and Sutton 1998) propose that change may occur on an underlying continuous scale and this appears to be supported by the current research findings. The results indicated that whilst there was no evidence that individuals used predicted processes within each stage, the general evidence emerging shows that use of processes increased as individuals progressed through the stages of change. The strongest finding to emerge from the results showed that precontemplators (PC) scored significantly lower in their recorded use of the processes of change when compared to individuals in the contemplation and preparation stages. Whilst results showing the use of processes amongst contemplation (C) and preparation (P) did not always support distinct differences between these stages (e.g. coping with the temptation to change and risk assessment strategies only demonstrated differences when PC was compared against C and P), this may be more indicative of a continuous measurement of readiness to change. The precontemplation individuals do not have any intention to change whilst contemplators are thinking about change and preparators are taking action to change. Therefore, individuals engaged in thinking or preparing for change may not be qualitatively different from each other when compared to individuals who are not thinking about changing. One could hypothesise that individuals engaged in change, either cognitively or behaviourally, would show closer ratings on a continuous scale when compared to those who are not planning to change behaviour. This certainly seems to be supported in the current results and it appears that examining the use of processes used to change behaviour does not support the TTM's proposal of distinct and quantifiable stages of change. Instead these results support the criticisms of the TTM model and indicate problems with the integrity and predictability of the core theoretical constructs.

9.2.2 The decisional balance

When the sample was considered as a whole, analysis of the ATS-18 questionnaire showed no significant differences in the sample's assessment of the pros and cons of smoking over time. Therefore, it appears that the introduction of the smoke-free legislation did not impact significantly on an individual's assessment of the pros and cons of smoking. Little variation was seen when the sample was examined in relation to age and gender. However, some change was observed in that older individuals rated the cons of smoking, adverse effects, more highly when compared to those in younger age groups. This may be a result of older individuals being more aware of their longevity and therefore more aware of the negative health consequences of smoking.

Findings in relation to daily cigarette consumption (DCC), demonstrated that as scores on the pros of smoking decreased (psychoactive benefits and pleasures of smoking), DCC was also found to significantly reduce. Therefore, individuals reported a drop in their perception of the pros of smoking and this cognitive change was observable in overt behavioural activities with a decline in cigarette consumption. This finding is replicated in previous research studies including Carbonari, DiClemente & Sewell, (1999), Prochaska et al. (1988) & Prochaska et al. (1991). Therefore these results were able to demonstrate a relationship between perceptions of the pros of smoking and DCC, adding some support to the influence of this variable in determining overt behaviour change.

The TTM emphasises that individuals at different stages of change will either focus on the benefits (pros) of the behaviour, or on the costs (cons) of a behaviour (Prochaska et al. 1992). Therefore this study hypothesised that individuals in the precontemplation stage would rate the pros of smoking as high and the cons of smoking as low. This was hypothesised to alter in a linear pattern across the stages of change, with pros of smoking decreasing across the stages and cons of smoking increasing (Fava et al. 1995). However, results obtained from the current study do not support this hypothesis. When members of each stage were compared in their ratings of the pros of smoking, *psychoactive benefits* and *pleasure of smoking*, no significant differences were observed between the stages. However, examination of the scores of the cons of smoking did show some significant differences when examined in relation to the stages of change.

Precontemplative individuals showed higher scores (indicating less agreement) on the adverse effects of smoking when compared to those in the contemplation and preparation stages. Therefore, precontemplators viewed their smoking more positively and were less inclined to acknowledge the cons of their behaviour.

The finding that no differences were found in the rating of the pros of smoking across the stages is difficult to explain utilising the predictions of the TTM. Again this may be a result of not using Prochaska et al.'s validated decisional balance scale. However, the ATS-18 does measure both the pros and cons of smoking, albeit using different concepts to describe the positive and negative connotations of smoking. Therefore, if these constructs are influential in the model's predictions concerning behaviour change, one should be able to observe them using alternative measurements. However, it may be possible that the pros of smoking items contained in this questionnaire were not sensitive enough to accurately measure the positive processes of smoking. This may hold true as the questionnaire did accurately measure the cons of changing and differences are observed between the stages. Conversely, as a negative relationship was demonstrated between low scores in the pros of smoking and DCC, these findings offer an alternative interpretation and suggest that the pros are sensitive enough to recognise changes in behaviour.

Regardless of whether change is most accurately measured by stages or via a continuous scale of readiness to change, both methods should demonstrate a difference between individuals who are changing and those who are not ready to change. Again, the data obtained from the decisional balance did seem to support this, however the results did not fulfil the TTM's predictions. Data concerning the cons only showed a distinct difference between PCs, who are not thinking about changing, and Cs and Ps who are either thinking or acting on behaviour change. In relation to the pros of smoking, no differences in evaluation were demonstrated across the stages. A similar finding was obtained by Etter and Perneger (1999a) who were able to observe longitudinal differences between the cons of smoking, but no differences within the pros. However, past research has indicated that individuals in the precontemplation stage should weigh smoking more positively and those in the later stages should view smoking more negatively (e.g. DiClemente et al. 1991 & Fava et al. 1995). In spite of this the current research

findings failed to support for these findings, and were more supportive of the findings obtained by Etter and Perneger (1999a). No evidence for distinct and quantifiable stages of change are observed in the results, again data is more indicative of two groups of individuals, rather than the five stages predicted by the model. Again, this is more supportive of a continuum of change measure as opposed to a stages of change measure. Or, it may be possible that a two categorical model would fit the data more appropriately, with individuals being grouped into those who do not want to change and those who are already changing (cognitively or behaviourally).

Another possible explanation for the findings in relation to the decisional balance may be due to the fact that the TTM focuses on intentional and conscious decision making. Critics have stated that the model fails to incorporate a behavioural learning element and completely neglects the notion of reward and punishment in maintaining habitual behavioural patterns. Robinson & Berridge (2003: cited in West 2005) argue that unhealthy behaviours can become an almost automatic process and therefore the aspects of reward and punishment may serve as a conditioned response. West (2005) expands this argument and suggests that these processes may operate without conscious deliberation and therefore are exempt from the TTM constructs including weighing up the pros and cons of the behaviour in question. This may hold true in the current findings, as these have failed to establish an expected predictive relationship between stage membership and the pros and cons of changing.

9.2.3 Stages of change movement

One of the aims of the current research project was to investigate how individual's stage membership may alter in light of the implementation of the smoking ban. Again due to the inherent limitations of the chosen research design, the results cannot accurately ascertain that stage movement was a direct consequence of the implementation of the smoke-free legislation. Rather, we are only able to deduce that changes in stage movement occurred over time. Results indicated that the greatest amount of stage movement was observed at T1 (Baseline) to T2 (3 months after ban implementation). In addition, the greatest stage progression was observed when T1 stages were compared against those at T2 and T3. Approximately one in five individuals progressed forward by one or more stages

when baseline figures were examined in relation to those at T2 and T2. Regression rates were similar to the progression rates with approximately one in four individuals regressing at T2 and one in five regressing at T2. The amount of individuals who remained static increased over time: T1 (56%); T2 (64%) and T3 (81%), with the greatest jump observed between T2 and T3.

The TTM model advocates that individuals in the preparation stage, who are getting ready to change, will show further stage progression than those in the PC and C stages. Again, this prediction was not supported in the current study's results. Rather, at every time interval, individuals in the PC and C stages demonstrated further stage progression than those in the P stages. In fact, the results indicated that in general, Ps were the most likely stage to regress over time. As these findings fail to show movement in the direction predicted by the model's stage classification, they further question the usefulness of the concept of stage progression. If no discernible predictions can be made concerning the influence of stage membership on progression towards implementing positive behaviour change, then this questions Prochaska et al.'s ascertation (Prochaska, DiClemente & Norcross, 1992; Prochaska, 1996) that the aim of interventions should be to move individuals forward by one or two stages. If stage progression is not predictive of moving towards overt behavioural change, then the notion that stage progression is a useful predictory concept is inaccurate. Indeed the current findings appear to concur more positively with the reviews conducted by Bridle et al. (2005) and Riemsma et al. (2003), suggesting that interventions based on the stages of change model showed limited effectiveness in facilitating stage progression. Overall, the study's results cast doubt on the suitability of stage membership as a useful tool for guiding behaviour change interventions and question the validity of the current model.

Although the temporal dimension of the TTM allows the model a unique position in the behavioural change field, it can also be considered to be a flaw in the model's theoretical position. Whilst the TTM is useful in that it postulates that change is not a single step, and instead is viewed as a set of stages through which individuals must evolve, the very nature of change over time besieges the model with difficulties. Past research has demonstrated that individuals do not progress neatly through each of the stages before maintaining a behaviour change. Rather,

stages can be skipped out and an individual may proceed from precontemplation to action (De Nooijer et al. 2005) without going through the contemplation and preparation stages. A further difficulty arises in the fact that individuals have been shown to progress through stages in a number of days and therefore due to their unstable nature, it may not be possible to use stages as a predictive tool. If on day one a participant is in precontemplation, in day three they are in preparation stage and by day six they are back down to contemplation, it makes it very difficult to make direct predictions concerning stage progression and the factors that influence this. Furthermore, the temporal dimension of the TTM also makes the implementation and direction of interventions very difficult. If individuals fluctuate through the stages without any intervention, then future research should explore the mediators and moderators of stage progression. This may provide a stronger empirical base for guiding interventions. In addition, previous research has suggested that stage membership is not mutually exclusive and therefore this creates further problems in interpreting data based on exclusive stages (Littell & Girvan 2002).

A method to combat these criticisms would be for additional research to be carried out utilising single participant case studies. These case studies could be used to assist researchers by providing further information concerning the nature of changes within stages of the TTM model. For example, an in-depth analysis would be useful in understanding how and when individuals progress through the stages of change and the factors that influence this movement. This may also assist in assessing whether individual movement is better represented by defined stages, or along a continuum of change.

9.3 Addiction

Based on the literature reviewed, the hypothesis formed in relation to addiction predicted that smokers in the precontemplation stage of the model would be most addicted to cigarettes, followed by those in the contemplation and preparation stages (DiClemente et al. 1991; Fava, Velicer & Prochaska, 1995). The results of the sample's nicotine addiction scores demonstrated no significant differences over time, and addiction scores remained relatively static. Furthermore and in relation to the study hypothesis, no significant differences were shown when addiction levels were compared across stages of change. Each stage of change,

from precontemplation to preparation reported similar levels of addiction. Overall, the sample's addiction scores were relatively low with a mean range from 3.84 to 4.10. A score of six or greater is categorised as being highly dependent on nicotine (Chabrol, Niezboral, Chaston & De Leon, 2005), therefore, the sample as a whole were only moderately addicted to nicotine. This may contribute to the lack of significant findings in relation to addiction levels altering over time. If the sample has low to moderate levels of addiction, there may be less scope for moving down the addiction scale. However, one could suggest that those who are not very addicted to nicotine may find it easier to change their smoking behaviours. This could therefore suggest that the sample has other, more pertinent barriers in place preventing them from altering their negative smoking behaviours.

Yet again, the large drop out over time, resulting in small sample sizes, may have impacted on the results obtained in relation to addiction levels. The sample did not reach the level of power set for the original recruitment target. This lack of power may not accurately allow interpretation of the results, and it may be that the population would demonstrate differences in relation to addiction levels over time. It is likely that due to the low level of power, the sample was too small to discriminate between the possible results and did not provide a true representation of the target population.

Likewise, the criticisms levied at the TTM within this section may also account for the lack of significant finding of a relationship between the stages and addiction. If the criticism holds true, and stages are not theoretically bound concepts, rather just arbitrary points along a continuous scale, this may provide an explanation for the lack of significant findings demonstrated.

It would have been useful to obtain a more scientific method of collecting information on nicotine use and addiction in order to corroborate the self report levels obtained from participants. One way to address this could have been to obtain cotinine levels from saliva swabs and use this to compare the smoker's self report ratings of nicotine use. However, this was out with of the current study's

capabilities and confines due to financial and time constraints. This may be an interesting area of work for future research in the area.

9.4 Limitations of the current study

One of the main criticisms levied at this study is the lack of a control group incorporated within the research design. The use of a control group would have been highly useful in further interpreting the study's findings. For example, whilst some casual relationships between the data have been demonstrated, (for example between cigarette consumption and the introduction of the smoking ban), the direction of these relationships cannot be accurately ascertained. Thus the findings can only state that a relationship between these variables exists, but it cannot establish that the smoking ban caused changes in cigarette consumption. Incorporating a control group would have resulted in a stronger research design and added more validity and robustness to the findings. Whilst the author acknowledges this flaw, the smoke-free legislation was implemented throughout Scotland and it proved impossible to obtain a control group within the country. An additional option would have been to recruit a control group from another part of the UK who were not subject to smoke-free legislation. Unfortunately though this study was restricted by financial, individual, and time restraints and it was not within the scope of the project to enable the use of a research control group.

Another key criticism of the current research concerns the small sample size reported. Whilst the initial recruited sample of 127 is a reasonable size, the large drop out reported over time made analysis of the results difficult. It is important to note that the small sample size achieved makes it difficult to infer the study's findings to the wider population and therefore the generalisability of the research is diminished. Moreover, the diminutive sample size resulted in a vast amount of non-normally distributed data. Consequently, much analysis was carried out using non-parametric techniques and these are not as precise or robust as parametrical techniques. This had obvious implications for the power of the analysis and the type of analysis able to be employed. A larger sample size would have been able to successfully address these issues and may have allowed for a more in depth analysis. This could have assisted in improving the generalisability of the research's findings, as the sample may have been more accurate in inferring results from the greater population.

A further criticism that may be aimed at the current study concerns the decision not to use the validated measures (Processes of Change scale & Decisional Balance scale) developed specifically for the TTM to test the core model constructs. If the current research pertained to examine the core TTM constructs, should the instruments designed, validated and utilised to measure these not have been used? Whilst this is a valid point, the author still believes that if the TTM is based in theory as the authors advocate, then the theoretical predictions of the model should be able to be tested and supported using alternative measures which quantify the same underlying constructs. If the model predictions were further supported by data obtained from similar measures, this would add more weight to the validity and strength of the TTM as a suitable model for examining behavioural change.

Obviously, this research relied primarily on data obtained from self-report measures. The limitations of self-report measures are well documented and largely concern the validity of the 'inventory premise' which assumes that individuals will accurately and truthfully respond to self-report questions. However, individuals bring their own constraints with them to research, and may be hampered by conscious or unconscious bias influencing how they wish to present themselves (Wilde 1972: cited in Derogatis & Derogatis 1990). As a result of this, it may have been useful to include some alternative methods of data collection within the current study design.

Another criticism of this study concerns the time of year the research data was collected. Data were collected over the seasons of spring, summer and autumn. At these times of the year, it would be easier for smokers to smoke cigarettes outside as the weather conditions are kinder than those seen over a Scottish winter. This may have influenced the sample and it is possible that different patterns of smoking behaviours may emerge over the alternative seasons. It would have been interesting to examine the effects that the winter season had on smoking behaviours and attitudes. An experimental design encompassing year round data collection points would be advocated for any future studies in this area.

A further limitation of the study is its' failure to accurately assess the impact on the smoke-free legislation on public health outcomes. It would have been useful to obtain data concerning outcomes influenced by smoking including heart attack admissions, national quit ratio rates and information on tobacco sales. However, this was not consistent with the original study aims and research design. This would be useful to include in future studies, which aim to evaluate the impact of smoke-free nation wide legislations.

Chapter 10

Conclusions and recommendations

Overall, the findings from this study demonstrated some positive changes associated with the introduction of the smoke-free legislation in Scotland. Results from the FTND showed that participants reported a decrease in cigarette consumption after the intervention, and positive attitudes towards the ban increased after its' implementation. These are promising findings, as decreases in tobacco use should result in positive public health outcomes and lead to better health for the nation. This is already indicative in research conducted after the ban's introduction, as Pell (unpublished) has demonstrated. Moreover, an increase in support for the ban suggests that the policy may be having an effect on individuals' perceptions towards smoking and realigning social group norms (Festinger, 1954 & Bandura, 1977). Indeed these findings add further support for Heloma & Jaakkola's (2003) research, suggesting smoke-free legislation is powerful in influencing social norms, and modelling behaviours formed as a result of the ban may shape acceptance of non-smoking as 'normalised' behaviour. If this finding is indicative of a positive change in social norms, and smoking becomes less attractive as a result of the smoking ban, this suggests that the motivational balance will shift negatively against smoking. Consequently over time, the smoke-free policy should result in a decrease in tobacco use and smoking prevalence (West 2007a).

These are positive findings and are consistent with the outcomes anticipated with the implementation of population policies and approaches as detailed by West (2006) (replicated in Table 1, pg. 6). The smoke-free legislation introduced in Scotland is a population policy aimed at facilitating individual behaviour change in order to directly impact and reduce tobacco use. This policy is employed alongside wider tobacco control initiatives which include (amongst others) tax increases, additional provision/ incentivisation of smoking cessation services and increased availability of stop smoking materials. These population level interventions all aim to work in conjunction with one another to shift motivational factors, making smoking less attractive, and consequently reduce the growth and uptake of tobacco use. The current work focuses on only one population policy, smoking restrictions. Whilst the findings obtained are promising, this work is

unable to account for the influence other policies may have had in contributing towards the observed changes in smoking attitudes and behaviours.

Further findings from the current study showed that individuals felt more in control of their smoking behaviours after the ban's implementation, increasing their feelings of empowerment and locus of control. Whilst addiction levels of the sample did not alter over time, this may be due to the fact that individuals reported a low or moderate level of addiction to cigarettes initially. Additionally, addiction levels were not found to be predictive of stage membership.

Whilst findings obtained in relation to smoking behavioural outcomes were promising, results failed to support the theoretical predictions of the TTM and advocate its use as an explanatory framework for behavioural change. The investigation of the construct of processes of change failed to demonstrate distinct and quantitative stages of change. Although processes were used less frequently in the earlier stages, and increased in the middle changes as predicted by Prochaska et al. (1991 & 1998), the results did not show clear differences between each of the stages. Rather, the findings seem more indicative of a continuum of change, and showed a clear relationship between those changing, either cognitively or behaviourally, and those individuals not wanting to change. This may also suggest that a two or three factor model may fit the model better than the current five stages presented. Consequently, this finding is more supportive of the criticism yielded at the model, suggesting that the stages are only artificial markers along a continuous scale of readiness to change (e.g. Bandura, (1997); Davidson (2002); Littell & Girvin (2002); & Weinstein, Rothman and Sutton (1998).

Similarly, the construct of the decisional balance scale failed to offer support for the distinct stages of change proposed by the TTM. Indeed the scores on the pros of smoking were not found to differ between any of the stages, and therefore the advantages of smoking were viewed as the same regardless of stage membership. However, some results indicated support for the notion of cons of smoking, and disadvantages were found to differ between stages. Whilst differences were not observed between each stage, the results showed that those in the PC stage rated the cons of smoking as less important than those in the C

and P stages. Again these findings suggest that the current five stage variable does not accurately fit the data and a continuous or two/three factor model may provide a more accurate analysis. Furthermore, these findings may suggest that the disadvantages of a behavioural habit are more influential in shaping behaviour change than the advantages and therefore do not offer support for the full decisional balance construct.

Whilst the processes of change and decisional balance constructs did offer some support for their influence in changing behaviour, the stages of change was shown to be the weakest concept of the model. Findings suggested that stage membership fluctuated, and individuals were found to progress and regress in roughly equal amounts. Furthermore, this movement appeared independent to the predictions equating from stage membership. Prochaska et al. (1992) argued that individuals in the preparation stage would be most likely to progress, however these findings failed to support this. Indeed individuals in the C and PC stages demonstrated most progression over time and those in the P stage demonstrated the most regression. Consequently these results propose that stage progression is not indicative of a move towards overt behavioural change and interventions based on this proposal require reworking.

Overall, the constructs of processes of change and the decisional balance of changing did offer partial support for their role in influencing behavioural change. However, these constructs did not fully corroborate the predictions made by the model, failed to operate in the direction anticipated and did not fully describe the patterns of behaviour change emerging. This therefore suggests that these constructs require additional conceptualisation and refinement. Whilst the support for these constructs was mixed, the results concerning the construct of stages of change was found to be very weak. These results suggest that the use of defined stages is unhelpful, flimsy, unpredictable, and may fail to exist in the form proposed by Prochaska and colleagues. The current stages were weakly related to the other constructs and failed to demonstrate predicted relationships towards overt behaviour change. Consequently, whilst the inherent nature of stages of change is highly appealing to the practitioner, the evidence base fails to support five distinct and quantifiable stages of change and therefore the translation of the model into practice remains in disrepute.

Future research should focus on comparing a continuous scale of readiness to change with the stages proposed by the TTM. In addition, research may examine if the stages of change would more accurately fit a two or three factor model of change. Large sample sizes, prospective research designs and randomised control trials could be implemented to test the TTM in this manner. Overall it appears that the TTM requires further definition and explanation concerning exactly how the core constructs work together to determine actual behaviour change. This could be achieved by revising the model and disposing of the stages of change variable as it currently stands. Or , as West (2005) argues it may be time to dismiss the use of this model altogether and confine it to the realms of historical explanations of behaviour change. Whilst these research findings do suggest that some constructs within the model have an influence on behavioural change, the notion of quantifiable stages of change remains questionable. Therefore doubt is cast on its usefulness as a predictive variable within the model. Overall, the findings obtained here failed to add validity to the integrity of the TTM, and instead add weight to its failures to accurately describe, explain and predict health behaviour change in relation to smoking.

Chapter 11

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Chapter 12

Appendices

Appendix 1

Smoking Behaviour Questionnaire – Baseline version

Smoking Behaviours Questionnaire: B

1. On average, how many cigarettes do you smoke on weekdays? _____

2. On average, how many cigarettes do you smoke on weekends? _____

3. How many days a week do you smoke cigarettes? _____

4. How old were you when you first started smoking cigarettes? _____

5. Where do you smoke most of your cigarettes?

Mainly at work ☐ Mainly at home ☐

Mainly in pubs/ cafes/ clubs ☐ Other (please describe) _____

6. If you could decide on the smoking policy in Scotland, how would you do it?
(please tick one only)

Complete ban on smoking in public (indoors) ☐

Complete ban of smoking in restaurants ☐

Complete ban of smoking in pubs and clubs ☐

Smoking allowed only in designated areas ☐

No smoking restrictions ☐

7. Before you heard about the Scottish smoking ban, were you seriously considering quitting smoking within the next 6 months?

Yes ☐ No ☐

8. After hearing about the Scottish smoking ban, are you seriously considering quitting smoking within the next 6 months?

Yes ☐ No ☐

9. Are you planning to quit smoking before the Scottish smoking ban is enforced?
(March 26, 2006)

Yes ☐ No ☐

10. Are you planning to quit smoking in the 30 days after the Scottish smoking ban is enforced?

Yes ☐ No ☐

11. Are you intending to cut down on the amount of cigarettes you smoke as a result of the Scottish smoking ban?

Yes ☐ No ☐

12. How many different times in your life have you made a serious and deliberate attempt to quit smoking?

_____

*If you have never tried to quit smoking, please go directly to question **16***

13. In the past 12 months, have you tried to quit smoking AND succeeded in not smoking for at least 24 hours?

Yes ☐ No ☐

14. What's the longest single period of time you have stayed away from cigarettes for?

_____

15. What methods did you use to stop smoking?

Willpower	☐	Zyban	☐
Nicotine patches/ gum/ equivalent	☐	Acupuncture	☐
Self-help books	☐	Other	☐
Hypnosis	☐	None of these	☐

16. How many other people smoke in your household? _____

17. Are there any smoking restrictions in your household?

Yes ☐ No ☐

*If no, go directly to question **19***

18. What restrictions on smoking exist in your home?

Total ban on smoking indoors	☐
Smoking only allowed in certain areas of the house	☐
Smoking only allowed in one room of the house	☐

19. How many times a month do you visit the following?

Pubs _____ Clubs _____

Restaurants _____ Cafes _____

20. On average, how many units of alcohol do you drink per week? _____

THANK YOU FOR TAKING THE TIME TO COMPLETE THESE QUESTIONNAIRES

Appendix 2

Smoking Behaviour Questionnaire – 3 month version

SUB ID:

Smoking Behaviours Questionnaire: 3M - CS

Please only answer this questionnaire if you are still smoking

1. On average, how many cigarettes do you smoke on each week day? _____

2. On average, how many cigarettes do you smoke on each weekend day? _____

3. How many days a week do you smoke cigarettes? _____

4. Where do you smoke most of your cigarettes?

Mainly at work ☐ Mainly at home ☐

Mainly outside pubs/ cafes/ clubs ☐ Other (please describe) _____

5. If you could decide on the smoking policy in Scotland, how would you do it? (please tick one only)

Complete ban on smoking in public (indoors) ☐

Complete ban of smoking in restaurants ☐

Complete ban of smoking in pubs and clubs ☐

Smoking allowed only in designated areas ☐

No smoking restrictions ☐

6. Are you seriously considering quitting smoking within the next 6 months?

Yes ☐ No ☐

7. Are you planning to quit smoking in the next 30 days?

Yes ☐ No ☐

8. Have you cut down on the amount of cigarettes you smoke as a result of the Scottish smoking ban?

Yes ☐ No ☐

9. In the past 3 months, have you tried to quit smoking AND succeeded in not smoking for at least 24 hours?

Yes ☐ No ☐

*If you have never tried to quit smoking, please go directly to question **12***

10. If you have tried to stop smoking in the last 3 months, how long did you stay away from
cigarettes for?

_____

11. What methods did you use to stop smoking?

Willpower	☐	Zyban	☐
Nicotine patches/ gum/ equivalent	☐	Acupuncture	☐
Self-help books	☐	Other	☐
Hypnosis	☐	None of these	☐

12. How many other people smoke in your household? _____

13. Are there any smoking restrictions in your household?

Yes ☐ No ☐

*If no, go directly to question **15***

14. What restrictions on smoking exist in your home?

Total ban on smoking indoors	☐
Smoking only allowed in certain areas of the house	☐
Smoking only allowed in one room of the house	☐

15. How many times a month do you visit the following?

Pubs _____ Clubs _____

Restaurant _____ Cafes _____

16. On average, how many units of alcohol do you drink per week? _____

THANK YOU FOR TAKING THE TIME TO COMPLETE THESE QUESTIONNAIRES

Appendix 3

Smoking Behaviour Questionnaire – 6 month version

SUB ID:

Smoking Behaviours Questionnaire: 6M - CS

Please only answer this questionnaire if you are still smoking

1. On average, how many cigarettes do you smoke on each week day? _____

2. On average, how many cigarettes do you smoke on each weekend day? _____

3. How many days a week do you smoke cigarettes? _____

4. Where do you smoke most of your cigarettes?

Mainly at work ☐ Mainly at home ☐

Mainly outside pubs/ cafes/ clubs ☐ Other (please describe) _____

5. If you could decide on the smoking policy in Scotland, how would you do it? (please tick one only)

Complete ban on smoking in public (indoors) ☐

Complete ban of smoking in restaurants ☐

Complete ban of smoking in pubs and clubs ☐

Smoking allowed only in designated areas ☐

No smoking restrictions ☐

6. Are you seriously considering quitting smoking within the next 6 months?

Yes ☐ No ☐

7. Are you planning to quit smoking in the next 30 days?

Yes ☐ No ☐

8. Have you cut down on the amount of cigarettes you smoke as a result of the Scottish smoking ban?

Yes ☐ No ☐

9. In the past 3 months, have you tried to quit smoking AND succeeded in not smoking for at least 24 hours?

Yes ☐ No ☐

*If you have never tried to quit smoking, please go directly to question **12***

10. If you have tried to stop smoking in the last 3 months, how long did you stay away from
cigarettes for?

_____

11. What methods did you use to stop smoking?

Willpower	☐	Zyban	☐
Nicotine patches/ gum/ equivalent	☐	Acupuncture	☐
Self-help books	☐	Other	☐
Hypnosis	☐	None of these	☐

12. How many other people smoke in your household? _____

13. Are there any smoking restrictions in your household?

Yes ☐ No ☐

*If no, go directly to question **15***

14. What restrictions on smoking exist in your home?

Total ban on smoking indoors	☐
Smoking only allowed in certain areas of the house	☐
Smoking only allowed in one room of the house	☐

15. How many times a month do you visit the following?

Pubs _____ Clubs _____

Restaurant _____ Cafes _____

16. On average, how many units of alcohol do you drink per week? _____

THANK YOU FOR TAKING THE TIME TO COMPLETE THESE QUESTIONNAIRES

Appendix 4

Self Change Strategies for Current Smokers questionnaire (SCS-CS)

SUB ID:

Self change strategies in current smokers (SCS-CS)

Please indicate how often you currently engage in the following activities or think about the following things by circling your answer.

1. I tell myself that I should stop smoking

Never Sometimes Fairly often Very often All the time

2. I tell myself that I am tired of being addicted to cigarettes

Never Sometimes Fairly often Very often All the time

3. I tell myself that I would be more physically fit if I stopped smoking

Never Sometimes Fairly often Very often All the time

4. I think about the benefits of giving up smoking

Never Sometimes Fairly often Very often All the time

5. I try to spend a whole evening without smoking

Never Sometimes Fairly often Very often All the time

6. In public places, I sit in the NO-smoking sections

Never Sometimes Fairly often Very often All the time

7. After meals, I keep myself busy rather than smoke

Never Sometimes Fairly often Very often All the time

8. To avoid the temptation to smoke, I stay away from place where people smoke

Never Sometimes Fairly often Very often All the time

9. I wait as long as I can before I light my first cigarette for the day

Never Sometimes Fairly often Very often All the time

P.T.O.

10. I tell myself that smoking will shorten my life

Never Sometimes Fairly often Very often All the time

11. I am afraid that smoking will give me lung cancer

Never Sometimes Fairly often Very often All the time

12. I think about the effects of smoking on my lungs

Never Sometimes Fairly often Very often All the time

13. The information on the risks of smoking gives me something to think about

Never Sometimes Fairly often Very often All the time

14. I tell others about my effort to quit smoking

Never Sometimes Fairly often Very often All the time

15. I tell others about my intention to quit smoking

Never Sometimes Fairly often Very often All the time

16. I ask friends and family for support to help me quit smoking

Never Sometimes Fairly often Very often All the time

17. To deal with my craving for cigarettes, I concentrate on other things

Never Sometimes Fairly often Very often All the time

18. I keep busy to overcome the urge to smoke

Never Sometimes Fairly often Very often All the time

19. I take deep breaths to fight off the desire to smoke

Never Sometimes Fairly often Very often All the time

THANK YOU FOR TAKING THE TIME TO COMPLETE THESE QUESTIONNAIRES

Appendix 5

Attitudes Towards Smoking questionnaire (ATS-18)

SUB ID:

Attitudes Towards Smoking Scale (ATS-18)

The following are some statements concerning smoking. Please indicate whether or not you agree with each of them by circling your answer.

1. Smoking is extremely dangerous to my health

Totally disagree Do not really agree More or less agree Agree Fully agree

2. Smoking is ruining my health

Totally disagree Do not really agree More or less agree Agree Fully agree

3. My cigarette smoke leaves an unpleasant smell

Totally disagree Do not really agree More or less agree Agree Fully agree

4. Smoking gives me very bad breath

Totally disagree Do not really agree More or less agree Agree Fully agree

5. I spend too much money on cigarettes

Totally disagree Do not really agree More or less agree Agree Fully agree

6. My cigarette smoke bothers other people a great deal

Totally disagree Do not really agree More or less agree Agree Fully agree

7. My second-hand smoke is dangerous to those around me

Totally disagree Do not really agree More or less agree Agree Fully agree

8. Smoking is bad for my skin

Totally disagree Do not really agree More or less agree Agree Fully agree

9. It bothers me to be dependent on cigarettes

Totally disagree Do not really agree More or less agree Agree Fully agree

P.T.O

10. I would have more energy if I did not smoke

Totally disagree Do not really agree More or less agree Agree Fully agree

11. A cigarette calms me down when I am stressed

Totally disagree Do not really agree More or less agree Agree Fully agree

12. Smoking calms me down when I am upset

Totally disagree Do not really agree More or less agree Agree Fully agree

13. A cigarette helps me deal with difficult situations

Totally disagree Do not really agree More or less agree Agree Fully agree

14. After a cigarette, I am able to concentrate better

Totally disagree Do not really agree More or less agree Agree Fully agree

15. I like the motions of smoking

Totally disagree Do not really agree More or less agree Agree Fully agree

16. It feels so good to smoke!

Totally disagree Do not really agree More or less agree Agree Fully agree

17. I love smoking

Totally disagree Do not really agree More or less agree Agree Fully agree

18. I like to hold a cigarette between my fingers

Totally disagree Do not really agree More or less agree Agree Fully agree

THANK YOU FOR TAKING THE TIME TO COMPLETE THESE QUESTIONNAIRES

Appendix 6

Fagerstrom Test for Nicotine Dependence questionnaire (FTND)

SUB ID:

FTND QUESTIONNAIRE

1. How soon after you wake up do you smoke your first cigarette?

Within 5 minutes

6-30 minutes

31-60 minutes

After 60 minutes

2. Do you find it difficult to refrain from smoking in places where it is forbidden such as church, the library, or the cinema?

Yes

No

3. Which cigarette would hate most to give up?

The first one in the morning

All others

4. How many cigarettes a day do you smoke?

10 or less

11 to
20

21 to
30

31 or more

5. Do you smoke more frequently during the first hours after waking than the rest of the day?

Yes

No

6. Do you smoke when you are so ill that you are in bed most of the day?

Yes
No

Appendix 7

Participant Information Sheet

Queen Margaret University College
EDINBURGH

PARTICIPANT INFORMATION SHEET
APPROVED BY THE QMUC ETHICS COMMITTEE

The Scottish smoking ban: Implications for smoking behaviours, attitudes and the stages of change. A longitudinal study of Scottish smokers.

My name is Toni Musiello and I am a postgraduate student from the school of Psychology at Queen Margaret University College. As part of my degree course, I am undertaking a research project for my Health Psychology dissertation. The title of my project is above.

What the study is about

This study is looking into Scottish smokers' experiences of the forthcoming Scottish smoking ban. I am interested in exploring your attitudes and smoking behaviours and examining how these may change over a period of time as a result of the smoking ban. The findings of the project will be useful, because they will provide information about how smoking behaviours may change as a result of the ban.

How you would be involved

I am looking for smokers who live in Scotland to take part in this study. There are no other criteria for being included or excluded – all smokers are welcome to participate.

If you agree to take part in the study you will be asked to fill out four self-report questionnaires. You will then be contacted 3 months and 6 months after the Scottish smoking ban has come into effect and asked to complete the same series of questionnaires. At each time period, the whole procedure should take no longer than 15 to 20 minutes. You will be free to withdraw from the study at any stage, and you would not have to give a reason for withdrawing.

All data will be anonymised, your name will be replaced with a participant number and it will not be possible for you to be identified in any reporting of the data gathered. The results may be published in a journal or presented at a conference.

Contact details

If you would like to contact an independent person, who knows about this project but is not involved in it, you are welcome to contact Dr Joyce Willock.
Please feel free to contact the researcher, Toni Musiello, concerning any other matters about taking part in this study. Both contact details are given below.

Dr Joyce Willock, Course Director
Psychology Department
Queen Margaret University College
Clerwood Terrace, Edinburgh
EH12 8TS
0131 3173610
jwillock@qmuc.ac.uk

Mrs Toni Musiello, Dphil student
Psychology Department
Queen Margaret University College
Clerwood Terrace, Edinburgh
EH12 8TS
0797 475 6979
tonimusiello@hotmail.com

Appendix 8

Participant Consent Form

Queen Margaret University College
EDINBURGH

CONSENT FORM

Title of Project:

The Scottish smoking ban: Implications for smoking behaviours, attitudes and the stages of change. A longitudinal study of Scottish smokers.

By signing this form you give consent to your participation in the project whose title is at the top of this page.

- You should have been given a complete explanation of the project to your satisfaction and been given the opportunity to ask questions.
- You should have been given a copy of the patient information sheet approved by the QMUC Ethics Committee to read and keep.
- Even though you have agreed to take part in the research procedures you may withdraw this consent at any time without the need to explain why.

CONSENT:

I, …….. (PRINT)

give my consent to the research procedures above, the nature, purpose and possible consequences of which have been described to me

by ……

Participant's signature ……

Date ……

Researcher's signature ……

Date ……

Subject ID: …….

Appendix 9

3 month follow up cover letter

Queen Margaret University College
EDINBURGH

3 MONTH FOLLOW UP – Toni Musiello's research project

The Scottish smoking ban: Implications for smoking behaviours, attitudes and the stages of change. A longitudinal study of Scottish smokers.

Dear participant,

It's been 3 months since you last took part in this study, and Scotland enforced the public smoking ban, banning smoking in all indoor public places. I am interested to hear how things have changed for you in the last 3 months. As agreed in your original consent form, please find enclosed the questionnaires for the 3 month research project follow up. Please read the relevant instructions below.

Still smoking?

If so, please only fill out the questionnaires in the section **Still Smoking.**

Stopped smoking?

If so, please only fill out the questionnaires in the section **Stopped Smoking.**

Once you have filled out the relevant questionnaires, I would be most grateful if you could return them in the stamped addressed envelope enclosed.

If you wish to contact someone concerning this study, or have any questions, please feel free to contact the researcher, Toni Musiello, or an independent person, Dr Joyce Willock. Both contact details are given below.

Dr Joyce Willock, Course Director
Psychology Department
Queen Margaret University College
Clerwood Terrace
Edinburgh
EH12 8TS
0131 3173610
jwillock@qmuc.ac.uk

Mrs Toni Musiello, Dphil student
Psychology Department
Queen Margaret University College
Clerwood Terrace
Edinburgh
EH12 8TS
078111 73359
tonimusiello@hotmail.com

THANK YOU FOR YOUR HELP WITH THIS PROJECT.

Appendix 10

6 month follow up cover letter

Queen Margaret University College
EDINBURGH

6 MONTH FOLLOW UP – Toni Musiello's research project

The Scottish smoking ban: Implications for smoking behaviours, attitudes and the stages of change. A longitudinal study of Scottish smokers.

Dear participant,

It's been 6 months since you last took part in this study, and Scotland enforced the public smoking ban, banning smoking in all indoor public places. I am interested to hear how things have changed for you in the last 6 months. As agreed in your original consent form, please find enclosed the questionnaires for the 6 month research project follow up. Please read the relevant instructions below.

Still smoking?

If so, please only fill out the questionnaires in the section **Still Smoking.**

Stopped smoking?

If so, please only fill out the questionnaires in the section **Stopped Smoking.**

Once you have filled out the relevant questionnaires, I would be most grateful if you could return them in the stamped addressed envelope enclosed.

If you wish to contact someone concerning this study, or have any questions, please feel free to contact the researcher, Toni Musiello, or an independent person, Dr Joyce Willock. Both contact details are given below.

Dr Joyce Willock, Course Director
Psychology Department
Queen Margaret University College
Clerwood Terrace
Edinburgh
EH12 8TS
0131 3173610
jwillock@qmuc.ac.uk

Mrs Toni Musiello, Dphil student
Psychology Department
Queen Margaret University College
Clerwood Terrace
Edinburgh
EH12 8TS
078111 73359
tonimusiello@hotmail.com

THANK YOU FOR YOUR HELP WITH THIS PROJECT.